

THE UNIVERSITY OF HULL

The Role of Engagement and Visual Imagery in Music Listening

being a Thesis submitted for the Degree of
PhD in Music Performance
at the University of Hull

by

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September 2019

Abstract

This thesis investigates music' responses to a selection of complete nineteenth and twentieth century piano works, with respect to their levels of musical engagement (heightened attention and interest towards the music; Olsen, Dean & Stevens, 2014) and their experience of music-induced visual imagery. Although engagement and visual imagery have been increasingly explored over the past two decades, little work has investigated the relationship between the two. Potential links, however, exist: for instance, the way visual imagery is described as one of the key mechanisms underlying listeners' emotional responses to music (Juslin et al., 2013). This thesis draws upon three different methodological approaches: two exploratory studies empirically investigate listeners' responses quantitatively, as well as qualitatively; the third study, a self-reflective account, draws upon the researcher's personal visual imagery experience as a performer.

In the two empirical studies, listeners provided continuous self-report measures of their engagement with the music, as well as the occurrence of any visual imagery during listening. Time series analyses revealed that engagement with the music was significantly associated with the experience of visual imagery; this was the case in both Studies 1 and 2. Granger causality tests were carried out to investigate the details of this relationship: overall, engagement mostly predicted visual imagery in Study 1; whilst a bidirectional relation of the series emerged more frequently in Study 2. In both studies, however, differences according to the piece and to the musical experience of the listener were apparent. A selection of listeners' individual differences (such as musical experience) are also reported, with respect to engagement and visual imagery responses. A thematic analysis of the qualitative data, collected through free written annotations and face-to-face interviews, led to the emergence of nine broad 'visual imagery types': (1) *Arbitrary*, (2) *Shared Musical Topics*, (3) *Idiosyncratic Sound Associations*, (4) *Emotions*, (5) *Material Abstraction*, (6) *Narratives*, (7) *Performance*, (8) *Personal Recollections*, and (9) *Pictorial Associations*. Examples of each category, alongside insights into the diverse range of imagery experiences, are provided. Finally, the self-reflective account explores visual imagery from a different perspective: the performer as listener. A pianist's visual imagery experiences are investigated across two contexts: the practice of a piano-duet work, comparing imagery data with that of a second pianist; and practising from memory, exploring the way imagery experiences may change with the absence of the score. Links to the qualitative 'visual imagery types' model are drawn throughout this exploration.

Keywords: *visual imagery, engagement, music listening, continuous responses, visual imagery types.*

Table of Contents

Abstract.....	ii
List of Figures	vii
List of Tables	x
Acknowledgements.....	xii
Introduction	1
0.1 Personal Rationale	1
0.2 Research Rationale	1
0.2.1 Research Aims.....	2
0.2.2 Content and Scope of the Research.....	2
0.2.3 Performance Portfolio	4
0.3 Terminology and Definitions.....	4
0.3.1 Visual Imagery.....	4
0.3.2 Musical Experience	5
0.3.3 Musical Topics.....	5
0.3.4 Key Terms.....	6
0.4 Structure of this Thesis	7
0.5 Associated Publications	7
Chapter 1. Visual Imagery and Engagement: The Potential for Common Ground.....	8
1.1 The Music Listening Experience	8
1.1.1 What is Imagery?	10
1.1.2 A Definition of Engagement.....	12
1.2 Visual Imagery and Engagement: An Overview of Possible Common Ground.....	13
1.2.1 Recent Research.....	13
1.2.2 The Underlying Emotional Response in Music Listening	14
1.2.3 The Additional Dimension and Further Links.....	15
1.3 Imagery in Music(ology).....	16
1.4 Summary: Engagement and Visual Imagery	17
Chapter 2. On Music, Engagement and Visual Imagery: Reviewing the Literature.....	19
2.1 A Question of Engagement	19
2.1.1 Engagement in Music Listening	19
2.1.2 Engagement Mapped through Continuous Self-Report Measures.....	21
2.2 Music and Visual Imagery	22

2.2.1 Imagery in Music Therapy.....	22
2.2.2 Visual Music and Visual Imagery.....	25
2.2.3 Recent Findings.....	28
2.2.4 Programme Notes and Dramaturgical Details	29
2.3 Special Experiences: On Visual Imagery.....	31
2.3.1 Synaesthesia.....	31
2.3.2 Blind in the Mind: Congenital Aphantasia	33
2.3.3 Mind Wandering	37
2.4 Summary	39
Chapter 3. Empirical Study 1: Quantitative Analysis	40
3.1 Aims.....	40
3.2 Method	42
3.2.1 Design.....	42
3.2.2 Participants	42
3.2.3 Materials	43
3.2.4 Procedure.....	45
3.2.5 Data Analysis.....	48
3.3 Results.....	50
3.3.1 Examples of Response Context.....	50
3.3.2 Tests of the Relationship between Engagement and Visual Imagery.....	60
3.3.3 Individual Differences	62
<i>Goldsmiths Musical Sophistication Index Scores.....</i>	63
3.4 Discussion.....	67
3.5 Limitations.....	69
Chapter 4. Empirical Study 1: Visual Imagery Types.....	72
4.1 Qualitative Data: Method	72
4.2 Qualitative Data Analysis	74
4.2.1 Visual Imagery Types.....	74
4.2.2 Shared Musical Topics.....	94
4.2.3 Drawn Annotations	98
4.2.4 Visual Imagery Types: Content Coverage	105
4.2.5 On the Imagery Experience.....	114
4.3 Limitations.....	117

Chapter 5. Empirical Study 2	118
5.1 Aims.....	118
5.2 Method	119
5.2.1 Design.....	119
5.2.2 Participants	120
5.2.3 Materials and Equipment.....	123
5.2.4 Procedure.....	125
5.2.5 Data Analysis	126
5.3 Results.....	126
5.3.1 Examples of Response Context.....	126
5.3.2 Tests of the Relationship between Engagement and Visual Imagery (Study 2)	137
5.3.3 Individual Differences (Study 2).....	139
Engagement Ratings	141
Goldsmiths Musical Sophistication Index Scores	141
5.3.4 Programmatic Information	145
5.4 Discussion.....	145
5.5 Quantitative Approach: Limitations.....	148
5.6 (Study 2) Qualitative Exploration: Visual Imagery Types.....	149
5.6.1 (Study 2) Shared Musical Topics	152
5.6.2 (Study 2) Visual Imagery Types: Content Coverage	154
5.6.3 Limitations.....	161
Chapter 6. The Performer as Listener	163
6.1 Music Performers and Visual Imagery	164
6.2 Visual Imagery in Piano Performance: A Self-Reflective Account	164
6.3 The Image in the Sound: Personal Examples	165
6.4 Visual Imagery and the Process of Memorizing.....	170
6.5 Discussion.....	174
7. Concluding Remarks	177
7.1 Research Findings	177
7.1.1 Aim 1	177
7.1.2 Aim 2	178
7.1.3 Aim 3	179
7.1.4 Aim 4	180

7.2 Directions for Future Research	180
References.....	181
Appendix 1. Performance Portfolio Commentary	I
Appendix 2. Conference List	IV
Appendix 3. Questionnaires	V
Appendix 4. Sample Question Sheet	VI
Appendix 5. Semi-Structured Interview Details	VII
Appendix 6. Interview Transcript Sample.....	VIII
Appendix 7. Cross-Correlation Function Graphs (Study 1).....	X
Appendix 8. Cross-Correlation Function Graphs (Study 2).....	XII
Appendix 9. Performers' Imagery Annotations.....	XIII
Appendix 10. Performers' Visual Imagery (Video)	XV
Appendix 11. Performance Video	XVI
Appendix 12. Performance Video	XVII

List of Figures

Figure 1. Extracted from Lamont (2011): Figure displaying a balanced approach to wellbeing, drawing on Seligman's framework (Seligman, Parks and Steen, 2005).....	20
Figure 2. Figure extracted from Tan and Kelly (2004), showing three participants' representations of Copland's Jubilee Variations.....	27
Figure 3. Graph extracted from Zeman, Dewar and Della Sala (2015). Participants with aphantasia and control participants' distribution of Vividness Visual Imagery Questionnaire (VVIQ) scores.....	35
Figure 4. Figure extracted from Blajenkova, Kozhevnikov & Motes (2006), illustrating a sample question from the spatial imagery battery of the Object and Spatial Imagery Questionnaire (OSIQ).....	35
Figure 5. Graph extracted from Watkins (2018). A preliminary, heuristic diagram illustrating one of the possible relations between aphantasia and severely deficient autobiographical memory.....	36
Figure 6. Extracted from Smallwood and Schooler (2015). Examples of related and unrelated tasks from self-generated thought and external distractions.....	38
Figure 7. Experimental set-up for the listening tasks.....	44
Figure 8. CARMA's review function, displaying one participant's continuous responses whilst listening to Debussy's Valse Romantique..	47
Figure 9. Experimental procedure and order of tasks.....	47
Figure 10. Responses to Debussy's Valse Romantique.....	52
Figure 11. Debussy's Valse Romantique, bars 72–79.....	53
Figure 12. Debussy, bars 83–88.....	53
Figure 13. Responses to Leginska's Cradle Song.....	54
Figure 14. Leginska, bars 19–28.....	55
Figure 15. Responses to Prokofiev's Suggestion Diabolique.....	56
Figure 16. Prokofiev's Suggestion Diabolique, bars 85–93.....	57
Figure 17. Responses to Rachmaninov's Etude-Tableaux Op. 33 No. 4.....	58
Figure 18. Rachmaninov's Etude-Tableaux Op. 33 No. 4, bars 32–38.....	59
Figure 19. Rachmaninov, Op. 33 No. 4, bars 19–21.....	59
Figure 20. Cross-correlation function (CCF) graphs between pre-whitened engagement and visual imagery global mean series (all participants merged into a single group), per piece.....	60
Figure 21. Estimated marginal means of participants' engagement ratings, as derived from the repeated measures ANOVA's main effect 'piece'.....	66
Figure 22. Comparison of the estimated marginal means from the more/less musically experienced groups, as derived from the ANOVAs independently performed on participants' engagement ratings and visual imagery ratings.....	67
Figure 23. Estimated marginal means of participants' visual imagery ratings, as derived from the repeated measures ANOVA's main effect piece. Error bars report the standard error of the mean.....	67
Figure 24. List of 'visual imagery types' in music listening, which emerged from the thematic analysis of participants' written annotations describing their visual imagery experiences.....	76
Figure 25. Carlo's continuous ratings for engagement and visual imagery whilst listening to Debussy.....	80

Figure 26. Gregory's (more musically experienced group) continuous ratings of engagement and visual imagery whilst listening to Rachmaninov.....	86
Figure 27. Lucy's continuous ratings for engagement and visual imagery whilst listening to Prokofiev.....	89
Figure 28. Carlo's continuous ratings for engagement and visual imagery whilst listening to Prokofiev	90
Figure 29. Fredric's continuous ratings for engagement and visual imagery in response to Debussy.	90
Figure 30. Opening bars of Rachmaninov's Etude-Tableaux Op. 33 No. 4.	97
Figure 31. Drawings from Grace's and Enzo's written annotations on their visual imagery, after listening to Prokofiev.....	97
Figure 32. Bars 5–6, Rachmaninov.	97
Figure 33. Bars 12–14, Debussy's Valse Romantique.	98
Figure 34. Rising and descending figure (left hand, from bar 29), Rachmaninov.....	98
Figure 35. Quinn's imagery annotations after listening to Debussy.....	99
Figure 36. Debussy's Valse Romantique, bars 12–15.	100
Figure 37. Quinn's imagery annotations after listening to Leginska.	100
Figure 38. Extract from Gregory's imagery annotations after listening to Leginska.	101
Figure 39. Leginska's Cradle Song, bars 1–2.....	101
Figure 40. Qiana's continuous ratings for engagement and visual imagery whilst listening to Leginska.	102
Figure 41. Qiana's imagery annotations after listening to Leginska.	102
Figure 42. Extract from Gregory's imagery annotations after listening to Prokofiev.....	103
Figure 43. Gregory's continuous ratings for engagement and visual imagery whilst listening to Prokofiev.....	103
Figure 44. Qiana's imagery annotations after listening to Prokofiev.	103
Figure 45. Quinn's visual imagery annotations after listening to Rachmaninov.	104
Figure 46. Top graph indicates Jack's continuous ratings for engagement (blue) and visual imagery (red) whilst listening to Rachmaninov's Étude-Tableau in D-Minor. Underneath, bars 5–8 of the piece.....	105
Figure 47. Bar chart displaying coding coverage (percentages) of the visual imagery types for the more and less musically experienced groups' annotations.....	107
Figure 48. Distribution of each visual imagery type between more and less musically experienced groups.	109
Figure 49. Bar chart displaying visual imagery types' coding coverage (percentages) across male and female participants.....	110
Figure 50. Bar chart displaying the visual imagery types' coding coverage (percentages) in each musical work (Debussy, Leginska, Prokofiev and Rachmaninov).....	112
Figure 51. Chord diagram displaying overlapped coded content between visual imagery types.....	114
Figure 52. Experimental procedure for Study 2, showing the sequence of listening tasks (engagement or visual imagery); and information provided for each piece in the 'programmatic listening' condition	126
Figure 53. Responses to Rachmaninov's La Nuit... L'Amour.	128
Figure 54. Bars 60–66 of La Nuit.....	130
Figure 55. Bars 125–130 of La Nuit.....	130
Figure 56. Bars 55–59 of La Nuit.....	131
Figure 57. Bars 14–16 of La Nuit.....	131

Figure 58. Responses to Rachmaninov's <i>Les Larmes</i>	132
Figure 59. Bars 24–25 of <i>Les Larmes</i>	134
Figure 60. Bars 14–15 of <i>Les Larmes</i>	134
Figure 61. Responses to Rachmaninov's <i>Pâques</i>	135
Figure 62. Bars 21–22 of <i>Pâques</i>	136
Figure 63. Bars 27–30 of <i>Pâques</i>	137
Figure 64. Cross-correlation function (CCF) graphs between pre-whitened engagement and visual imagery global mean series (all participants merged into a single group), per piece.	138
Figure 65. Comparison of estimated marginal means from the more and less musically experienced groups, as derived from ANOVAs independently performed on engagement ratings and visual imagery ratings.	144
Figure 66. Querida's visual imagery annotations after listening to <i>La Nuit</i>	152
Figure 67. Chloe's imagery annotations after listening to <i>La Nuit</i>	152
Figure 68. Ken's visual imagery annotations after listening to <i>Pâques</i>	154
Figure 69. Ken's imagery annotations after listening to <i>La Nuit</i>	154
Figure 70. (Study 2) Bar chart displaying coding coverage of the visual imagery types for the annotations of more and less musically experienced groups.	156
Figure 71. Distribution of each visual imagery type between more and less musically experienced groups in Study 2.	157
Figure 72. Coding coverage of visual imagery types across male and female participants for Study 2.	157
Figure 73. Coding coverage of visual imagery types (percentages) in each musical work (<i>La Nuit</i> , <i>Les Larmes</i> , and <i>Pâques</i>) for Study 2.	159
Figure 74. Chord diagram displaying overlapping coded content between visual imagery types in Study 2.	161
Figure 75. Opening bars of <i>La Nuit</i> ... <i>L'Amour</i> , second movement from Rachmaninov's <i>Suite No. 1, Fantaisie-Tableaux, Op. 5</i>	166
Figure 76. Bars 14–16 from <i>La Nuit</i> ... <i>L'Amour</i> , Rachmaninov.	167
Figure 77. Bars 32–34 from <i>La Nuit</i> ... <i>L'Amour</i> , Rachmaninov.	168
Figure 78. Bars 43–45 from <i>La Nuit</i> ... <i>L'Amour</i> , Rachmaninov.	169
Figure 79. Bars 30–33 from Poulenc's ' <i>Caprice Italien</i> ', third movement of <i>Napoli suite</i>	172
Figure 80. Position of the hands at bar 31 of Poulenc's ' <i>Caprice Italien</i> ', the start of the tarantella theme ^m	172
Figure 81. Bars 75–83 from Poulenc's ' <i>Caprice Italien</i> '.	173
Figure 82. Position of the hands at bar 80 (second quaver) of Poulenc's ' <i>Caprice Italien</i> '.	173

List of Tables

Table 1. Summary of key terms and definitions.....	6
Table 2. Table extracted from Tan and Kelly (2004), showing significant findings for content analysis of participants' verbal descriptions of their annotations.....	26
Table 3. Table extracted from Zalanowski (1986), displaying mean ratings of attention, enjoyment, understanding ratings and memory scores for the two music selections.....	30
Table 4. Participants' demographic details for the more and less musically experienced groups.....	43
Table 5. Details of music pieces used as auditory stimuli.....	44
Table 6. Outcome of the Granger causality tests per group and piece, specifying the level of differencing required to achieve stationarity of the series (first or second order), the significant lags at which Granger tests are performed and the direction of the Granger causality.....	61
Table 7. Correlations between pieces for engagement and visual imagery ratings.....	62
Table 8. Correlations between absorption, engagement ratings per piece, and subscales of the Gold-MSI.....	63
Table 9. Correlations between participants' mean engagement and liking ratings per piece, and liking ratings and absorption scores.....	64
Table 10. Correlations between pieces' familiarity ratings, as well as correlations between the familiarity ratings of the pieces' musical styles.....	65
Table 11. Study 1 participants' pseudonyms, demographic and musical experience group details.....	78
Table 12. Topics emerged from participants' visual imagery annotations.....	95
Table 13. Coding coverage of the nine visual imagery types for the sample's annotations.....	106
Table 14. N. of participants coded for each visual imagery type across the sample.....	107
Table 15. Coding coverage for each of the nine visual imagery types across more and less musically experienced groups, where the sum of the two groups' imagery type coding accounts for 100% of its coding content.....	109
Table 16. Coding distribution for each of the nine visual imagery types across pieces, where the sum of the four pieces' coding accounts for 100% of the imagery type.....	112
Table 17. Demographic details for the more/less musically experienced groups in Study 2.....	120
Table 18. Pseudonyms, age, group details, and conditions for participants in the listening tasks.....	122
Table 19. Details of the music pieces used as auditory stimuli for Study 2, selected from Rachmaninov's Fantaisie-Tableaux, Op. 5, for two pianos.....	124
Table 20. Outcome of the Granger causality tests per group and piece, specifying the level of differencing required to achieve stationarity of the series (first or second order), the significant lags at which Granger tests are performed and the direction of the Granger causality.....	139
Table 21. (Study 2) Correlations between pieces for engagement and visual imagery ratings.....	140
Table 22. (Study 2) Correlations between absorption, engagement ratings per piece, and subscales of the Gold-MSI.....	141
Table 23. (Study 2) Correlations between participants' mean engagement and liking ratings per piece, and liking ratings and absorption scores.....	142
Table 24. (Study 2) Correlations between familiarity ratings of the pieces, as well as correlations between familiarity of the musical styles of the pieces.....	143

<i>Table 25. Study 2's visual imagery types, alongside examples extracted from participants' visual imagery annotations.....</i>	<i>149</i>
<i>Table 26. Topics emerging from participants' visual imagery annotations (Study 2).....</i>	<i>152</i>
<i>Table 27. Coding coverage of each visual imagery type across the sample's annotations</i>	<i>154</i>
<i>Table 28. (Study 2) N. of participants coded for each visual imagery type across the sample.</i>	<i>155</i>
<i>Table 29. (Study 2) Coding coverage for each visual imagery type across more and less musically experienced groups, where the sum of the two groups' coding of visual imagery type accounts for 100% of the coding content.....</i>	<i>156</i>
<i>Table 30. (Study 2) Coding distribution for each of the nine visual imagery types across pieces, where the sum of the coding of the four pieces accounts for 100% of the visual imagery types.</i>	<i>158</i>
<i>Table 31. Summary of the visual imagery types emerged in the researcher's self-reflective account of mental images during music practice/performance, and their context.....</i>	<i>175</i>

Acknowledgements

The completion of this PhD has been a long, intense journey, and this work would have never been completed without the significant support received from lecturers, colleagues, friends and family members; and to the many names that do not appear in the brief list below, I would still like to express my sincere gratitude for the help received. You know who you are.

First of all, I would like to thank my extraordinary supervisors: Dr. Helen Prior and Prof. Alastair Borthwick, who very patiently guided this thesis to its completion, sharing their academic expertise and providing constant encouragement throughout. I am also especially grateful to my former supervisors, who helped me setting the ground and direction of my PhD studies: Dr. Freya Bailes, to whom I am indebted for everything I have learned on time series analysis and R programming, as well as for answering the not insignificant quantity of emails on Granger tests from her new position at Leeds; and Dr. Lee Tsang, who provided enormous support in the performance side of the PhD, and with whom it was a pleasure to collaborate and perform in the Leginska project. I would also like to thank the University of Hull's scholarship programme, for providing the financial support over the first three years of this course.

There are no words to express my gratitude to my teacher, pianist Irina Glushenkova, for a truly inspiring and unforgettable pianistic journey. I must also thank Libby Burgess, with whom I had the pleasure of performing the closing work of my final recital. Special thanks also to Mark Stein, Arthur Warhurst, Jenny Potts, Tony Courts and Aled Edwards for arranging my numerous bookings in the Middleton Hall and for their technical support. Thanks are also due to my PhD colleagues and friends who helped in the staging and concert management of my final recital, alongside making this journey a very enjoyable one: Iliana Ivancheva, Sandy Clark, George Marshall, Lewis Kennedy and Stanislava Svarogina; and to every member of the audience for their support.

I am grateful to each of the 75 participants who gave their time to complete my empirical studies, enabling this research to take place. Thank you also to Girard Jeffrey, who invested time and work to adapt his CARMA software to the requirements requested, enabling the data collection for my research. Particular thanks go also to Dr. Mats Küssner and the visual imagery research team which emerged from the two KOSMOS dialogues—without doubt the two most inspiring and friendly conferences I have ever attended. Thank you also to Joseph Lambert and Margaret Pinder, for thoroughly reading through sections of my programme notes and thesis; and to YUBA Studio, George Sztuka and Brice Catherin for their meticulous audio/video editing assistance.

I would like to thank my friends for reminding me that, after all, I am only human and in need of some breaks; in particular, thank you to Serena Pignatelli, Hana Drábková, Camilla Lombardi and Ingrida Lusaite for the supportive friendship and considerable supply of coffee, and to my geographically—but only geographically—distant friends, Chara Riala and Yumin Lim.

Finally, special thank you to Andreas Metaxas and Mrs Mary Davidson for their priceless support, and to my parents to whom I dedicate this thesis; in particular to my dad, whose frequent question “How many words are left?” accompanied many of my days, and to which I have the pleasure to finally answer “It's done!”.

Introduction

0.1 Personal Rationale

This thesis, in conjunction with the performance portfolio, is the culmination of an exciting research project developed over the course of a Music Performance PhD. At the heart lies an exploration of what, arguably, may be regarded as one of the most complex, fascinating phenomena of the mind: visual imagery. The experience of visual imagery can vary significantly across individuals: to some, visual imagery is a habitual practice of everyday life; to others, mental images only occur in rare instances, if at all. As a pianist who frequently experiences visual imagery in music listening as well as during performance-related activities, the wide-ranging variety of my imagery responses inspired the rationale behind this dissertation: to investigate music listeners' visual imagery responses to piano works and the ways in which such experiences potentially link to listeners' fluctuating levels of engagement.

0.2 Research Rationale

Existing research on visual imagery in the field of psychology provides a range of insights into this complex phenomenon (Ganis, 2013; Kosslyn, Thompson & Ganis, 2006; Kosslyn, 1980). An interest in visual imagery in response to music has gained ground in the past two decades (Taruffi & Küssner, 2019; Küssner & Eerola, 2017; Tavernaro, 2016; Juslin et al., 2010), and visual imagery has been increasingly associated with emotions (Juslin & Västfjäll, 2008; Balteş & Miu, 2014; Vuoskoski & Eerola, 2015). However, surprisingly little work has investigated the relationship between music listeners' experiences of visual imagery and their engagement (heightened attention and interest; Olsen, Dean & Stevens, 2014) with the music. The purpose of this thesis is to find out more about how music listeners experience visual imagery. The three studies presented in this thesis contribute towards the investigation of two broad overriding research questions:

1. *What contributes to the experience of visual imagery in music listening?*
2. *In what ways do music listeners experience visual imagery?*

The first research question is explored in two empirical studies (Chapters 3 to 5) investigating the relationship between music-induced visual imagery and levels of engagement with the music. In the context of music listening, engagement is associated with the induction of flow or absorption (Dean & Stevens, 2014), that is, feeling 'compelled, drawn in, connected to what is happening in the music'

(Schubert, Vincs & Stevens, 2013:4). Over the past two decades, both visual imagery and engagement have gained a renewed research interest; yet, remarkably little work has specifically investigated the possible imagery–engagement relationship. This is surprising, considering the potential role of affect as a common ground between the two; for instance, the way visual imagery has been described as one of the key mechanisms underlying music listeners' emotional reactivity (Juslin et al., 2010; Juslin, 2013). This thesis serves as a response to the paucity of empirical evidence for this relationship.

The second research question is explored across all three studies in their qualitative components. The qualitative data collected provides the opportunity to gain further in-depth insights into music listeners' experiences of visual imagery. In addition, the third study presents a self-reflective account of the visual imagery that emerged during my performance-related activities (Chapter 6), providing a further perspective on the ways in which visual imagery can be experienced.

0.2.1 Research Aims

With the above in mind, the aims of this thesis are as follows:

1. To assess whether a relationship is present between visual imagery and real-time engagement with music.
2. To empirically investigate visual imagery in music listening through quantitative and qualitative explorations.
3. To explore a selection of participants' individual differences in visual imagery and engagement responses, as well as the possible influence of programmatic information.
4. To explore, through a self-reflective account, personal visual imagery experiences during piano practice and performance sessions, investigating the ways in which these relate to the qualitative model which emerged from the empirical studies.

In line with the exploratory nature of this research, it is important to emphasise that, whilst possible areas for common ground between engagement and visual imagery are pointed out, it is not within the scope of the present work to assess the mechanisms involved in such a relationship; nonetheless, potential areas for future research are signposted throughout.

0.2.2 Content and Scope of the Research

In order to address the aims stated above, this thesis will shed further light on the complex visual imagery process and range of imagery experiences during musical engagement by pursuing five objectives. First, it will establish whether a relationship is present between music listeners' visual

imagery and engagement through the collection of continuous self-report responses and the use of complete musical works. Second, it will ascertain visual imagery and engagement responses in relation to a selection of participants' individual differences. Third, it will model the content and variety of visual imagery responses through the collection of qualitative data. Fourth, it will establish the possible influence of the musical works' programmatic information (title and epigraph) on listeners' engagement and visual imagery responses. Finally, it will provide an alternative perspective on visual imagery experiences through a self-reflective account.

As mentioned earlier, visual imagery experiences can vary greatly across individuals: Juslin (2011) notes the 'wide individual differences between listeners regarding imagery' (p. 123). To investigate which individual characteristics may relate to visual imagery responses, a selection of individual differences will be investigated: participants' musical expertise; their spontaneous use of visual imagery; their tendency to experience absorption during music listening; and finally, ratings of their familiarity with, and liking of, the pieces.

The possible influence of the works' titles and programmatic information will be explored as a further variable in the second empirical study of this thesis (Chapter 5). Past research suggests that the presence of 'dramaturgic details' can impact on the listener's perception of musical works (Landy, 2006; Vuoskoski & Eerola, 2013). Leigh Landy's Intention/Reception project (2006), for instance (although conducted specifically in relation to electroacoustic compositions) investigated the way composers' articulation of intent can 'help people find means to listen to, appreciate and find meaning' in the music (p. 29). Indeed, the 'something to hold onto factor' at the basis of Landy's project can be a particularly influential feature, which may also impact on music listeners' experiences of visual imagery. However, beyond the information surrounding a piece of music, it is most likely to be the music and one's personal listening experience that plays the central role. In emotional responses to music, Juslin (2013) suggests influences of the music, the listener, and the situation (p. 238)—influences which are also likely to relate to visual imagery experiences.

Juslin's (2011) theoretical discussion of visual imagery suggests that 'certain musical features (...) may be especially effective in stimulating imagery' (p. 123). However, little has been done to investigate what these musical features may be. Gaining an insight into participants' listening experiences and responses is just as relevant as achieving an understanding of the music which provoked them. In this respect, the musical context will be considered throughout the empirical discussions, drawing a link, where possible, between the music and participants' responses.

0.2.3 Performance Portfolio

Music-related visual imagery has also been explored throughout the associated performance portfolio in a longitudinal process which developed alongside this thesis (a detailed discussion of this process may be found in Appendix 1). The first-hand exploration of visual imagery across performance practice supported the thesis in many respects: for instance, it helped to reflect on the ways in which musical works are generally considered (discussed in Chapter 1); it enabled a more comprehensive understanding of the visual imagery accounts reported by participants (Chapters 4 and 5); and shaped the self-reflective imagery account reported in Chapter 6. Furthermore, recordings of the researchers' own performances served as audio stimuli for the two experimental studies (the first involving solo piano works; and the second comprising a piano-duet, performed with a second pianist); whilst the video recording of Poulenc's *Caprice Italien* (Appendix 11) emerges from section 6.4 of the thesis, exploring 'Visual Imagery and the Process of Memorizing'.

0.3 Terminology and Definitions

0.3.1 Visual Imagery

In cognitive psychology, *imagery* (or *mental imagery*) refers to the human ability to generate mental representations of sensory experiences, despite the absence of physical stimuli: as defined by the *APA Dictionary of Psychology*, the term 'imagery' broadly refers to 'mental images considered collectively' ('Imagery', n.d.).¹ Such mental images may be conjured up across multiple senses or individually, and may be formed by imagination or memory (Colman, 2015). *Visual imagery* stems from the broader family of imagery experiences (Taruffi & Küssner, 2019) and pertains, more precisely, to the visual modality—'seeing' images in one's mind. The variety of literature concerning this complex phenomenon, however, reveals a range of terms which can lead to confusion. Taruffi and Küssner (2019) rightly argue the need to clarify conceptual ambiguities and appropriate, clear terminology to differentiate from other terms, such as *mind-wandering*. In order to clarify the terms employed in this thesis, Section 0.3.4 presents a selection of key words, alongside a concise definition.

As previously mentioned, the present thesis focuses on *visual imagery*. For brevity, mentions of 'imagery' in this thesis nonetheless refer to the visual imagery, unless otherwise specified (this is predominantly the case for Section 1.1.1, outlining the different sensory modalities of imagery).

¹ See 'Imagery', *APA Dictionary of Psychology*, <https://dictionary.apa.org/imagery>.

0.3.2 Musical Experience

Before moving further, it is important to clarify the intended meaning of some of the terms employed for the purpose of this research. 'Musical experience' is one of the selected individual differences being explored: participants are divided between 'more' and 'less musically experienced' groups, based on the ranking of the Goldsmiths Musical Sophistication Index's (Gold-MSI; Müllensiefen et al., 2014) *Musical Training* battery scores (further details are provided later). Such a division is intended to enable comparisons between participants who experienced a greater amount of formal music training and practice of an instrument, with those who experienced less (for example, questions from this battery include numbers of regular, daily practice hours, years of formal instrumental teaching received, or being complimented as a performer). Therefore, whilst acknowledging that the broader concept of being 'more musically experienced' can relate to numerous features of one's musical expertise, this research focuses on the practical aspects described above.

0.3.3 Musical Topics

Chapter 4 contains some discussion of musical topics. The term 'topics' has its roots in Ratner's influential treatise *Classic Music: Expression, Form and Style* (1980). The author defines topics as 'subjects for musical discourse': a 'thesaurus of characteristic figures' developed by eighteenth century composers, which can be associated, for instance, with feelings or have 'a picturesque flavor' (p. 9). Ratner divides topics into two broad categories, although such a distinction is flexible (*ibid.*): *types*, which include topics such as dances or marches (as Mirka (2014) pointed out, *types* may be regarded as the equivalent of genres); and *styles*, described as 'progressions within a piece', which include the military or the hunting topics among others. Following Ratner's work, the concept of topics has been developed by numerous music scholars, expanding its application beyond eighteenth century repertoire and increasing the range of topics. Whilst this is a particularly broad area of research, the definition of topics adopted in the present thesis aligns with the following description by Tarasti (2012): 'In music, these [topics] consist of characteristic, recurrent musical style features and elements, which are often borrowed from extramusical realities and inserted into musical works as particular "signs"' (p. 460). A key aspect to this research's approach, however, is the way participants' visual imagery responses will determine the identification of topics across the musical works (this will be discussed in Chapter 4 in greater detail). In this respect, for the purpose of this thesis, topics will be confined to recurring visual imagery experiences (across multiple participants) which appear to link musical instances, aspects or features with extramusical

references, by means of an aural association of some kind (e.g. imagery related to water, bird-song, dances, and so on).

0.3.4 Key Terms

The table below summarises a range of key terms, alongside their definitions, employed in this thesis. Although each of these terms will be elucidated later in greater detail, it enables a brief reference guide for the reader.

Table 1. Summary of key terms and definitions.

Term	Definition
Absolute Music	Emerging from a philosophical debate arguing music's self-dependence, this line of thought regards music as an autonomous entity which does not seek connotations to external meanings or references (Scruton, 2001a; Hanslick, 1986).
Congenital Aphantasia	Also described as 'blind imagination', congenital aphantasia refers to a condition characterised by the reduced ability (or inability) to produce voluntary imagery (Zeman, Dewar and Della Sala, 2015).
Imagery	The mental representation of a stimulus despite the absence of a physical stimulus, which may be generated by imagination or memory (Colman, 2015). Imagery can be experienced through any of the senses (e.g. visual, auditory, kinaesthetic, tactile, etc.), and may be conjured up in a unisensorial manner or concurrently across multiple senses. Also referred as 'mental imagery' (Ibid.).
Mental Imagery	Another term for 'Imagery' (see 'Imagery' entry for definition).
Mind Wandering	A phenomenon generally characterised by spontaneous thoughts and attention drifting away from the performed task, resulting in thoughts that are unrelated to the 'here and now' (Smallwood & Schooler, 2015). Visual imagery is one of the possible forms in which mind wandering can be experienced (Taruffi & Küssner, 2019; Taruffi et al., 2017).
Musical Engagement	Heightened attention and interest towards the music (Olsen, Dean & Stevens, 2014), associated with the induction of 'flow' (Csikszentmihalyi, 1990) or absorption—a state of mind 'in the zone'.
Musical Experience	In the present thesis, participants' division between 'more' and 'less musically experienced' groups is based on the ranking of the <i>Goldsmiths Musical Sophistication Index's</i> (Gold-MSI; Müllensiefen et al., 2014) <i>Musical Training</i> battery scores (see Section 0.3.2 for further details).
Musical Topics	Musical topics may be described as musical features, or patches of music, that trigger associations that are external to the music (Hatten, 2004). Topics are inserted into the musical work as expressive "signs" for the listener, often borrowing elements from extramusical realities (Tarasti, 2012:460)—e.g. the hunt topic may be perceived through the melody of a hunting horn call.
Programme Music	In contrast to 'absolute music', 'programmatic' works are characterised by their connotations with explicit extramusical content; therefore, these works generally intend to musically convey events or objects without resort to sung words (Scruton, 2001b).

Synaesthesia	A condition in which the stimulation of one sense involuntarily causes the stimulation of an additional sensation, which may or not be in the same sensory modality (Specht, 2012).
Visual Imagery	The ability to generate images in one's mind; “seeing” in the absence of a sensory stimulus (Taruffi & Küssner, 2019: 62). In relation to music, Taruffi & Küssner (2019) describe visual imagery as ‘the mechanism whereby music stimulates internal images in the listener’, which may consist, for instance, of ‘pictorial representations (e.g., natural landscape, colors), embodied image-schemata (e.g., picturing a melodic movement as an ascending or descending image), or complex visual narratives (e.g., similar to that of a movie)’ (p. 63).

0.4 Structure of this Thesis

The first chapter of this thesis identifies potential areas of common ground between the experience of visual imagery and engagement during music listening. The chapter gathers existing literature and theoretical models which, explicitly or implicitly, point towards an imagery–engagement link. Detailed definitions of visual imagery and engagement are also provided, followed by a brief musicological contextualization of the following work. Whilst musicological investigations are not the central concern of this research, links between participants' responses and their musical context are nonetheless made throughout. Chapter 2 divides into two parts: the first predominantly explores studies which individually investigate engagement and visual imagery, this time with a focus on music-related research contexts; the second introduces what may be considered some of visual imagery's ‘exceptional experiences’, such as synaesthesia or congenital aphantasia, including a brief overview of the phenomenon of mind wandering. The subsequent three chapters present the two empirical studies of this thesis: Study 1 stretches over both Chapter 3 (quantitative analysis) and Chapter 4 (qualitative findings); Study 2 is described in Chapter 5. Chapter 6 encompasses the researcher's self-reflective account of her personal visual imagery experiences, whilst also briefly referencing the imagery data of a second pianist. This is followed by a concluding discussion.

0.5 Associated Publications

Chapter 3 of this thesis, presenting the quantitative findings of the first empirical study, has been accepted for publication in the form of a journal article. The manuscript includes Dr. Freya Bailes as second author, and the reference is as follows:

Presicce, G., & Bailes, F. (2019). Engagement and Visual Imagery in Music Listening: An Exploratory Study. *Psychomusicology: Music, Mind and Brain*, 29(2-3), 136-155.

Other aspects of this research have been presented, in the form of preliminary findings or discussions, in various conferences (for a complete list, see Appendix 2).

Chapter 1. Visual Imagery and Engagement: The Potential for Common Ground

This chapter provides an introduction to two aspects of the music listening experience which will be of central concern in this thesis: visual imagery; and engagement with the music. Section 1.1 will set out the content and scope of this research, providing definitions of imagery and engagement. Section 1.2 highlights potential areas for common ground between the two fields, drawing upon existing literature and theoretical models which point towards a possible imagery–engagement link (further empirical studies individually investigating imagery and engagement within music-related research contexts will be reviewed later in Chapter 2). Finally, Section 1.3 will provide a brief musicological context of music and imagery, establishing the musicological standpoint of the present work.

1.1 The Music Listening Experience

The range of reactions music is able to evoke in its listeners has been widely acknowledged and empirically supported across various research fields. A brief look into the ever-growing research field of music-induced emotions (for a review, see: Juslin & Sloboda, 2010; Eerola, 2018) immediately brings to light the variety and prevalence of such music-influenced experiences: for instance, the physiological responses music may give rise to (Hodges, 2016; Dousty, Daneshvar & Haghjoo, 2011; Schäfer & Sedlmeier, 2011), or music's effect on mood regulation (Garrido, 2016; Vuoskoski & Eerola, 2017; Taruffi, & Koelsch, 2014). For many listeners, music can also give rise to the experience of visual imagery: 'it seems that as listeners receive music, they often associate it with beliefs, sentiments and images' and 'may characterize a musical work somewhat programmatically' (Campbell, 1998:174). Yet, if listeners *may* experience imagery, under what circumstances could this occur? In other words, *what contributes to the experience of visual imagery in music listening?*

The term 'mental image' refers to a representation of the type created in the initial phases of perception, but without the stimulus being actually perceived (Kosslyn, Thompson & Ganis, 2006:4); described in simpler terms, with regards to the visual modality, an image is 'seen' in one's mind, but not directly observed through one's eyes. Visual imagery is complex and highly idiosyncratic: the ability to imagine visually can vary greatly amongst individuals, and even within individuals at different times. For instance, in music listening, one's experience of imagery can vary significantly with the unfolding of a piece: there may be instances in which the listener's visual imagination will

take the lead; in others, some kind of imagery may be present in the mind, but may be difficult to define or decipher; and then, on other occasions, no imagery will be experienced at all. Imagery may also occur in different ways; perhaps prompted by specific sounds, experienced intermittently, or stretching over the entire musical work in a sort of narrative (we will later gain a closer insight into the variety of visual imagery experiences gathered by the two empirical studies in this thesis—see Chapters 4 and 5 for qualitative investigations). Yet, just as one's visual imagery can fluctuate with the unfolding of the music, so too does one's interest in and attention to the sounds being heard; and it may be during those particular moments of heightened interest, as the mind is immersed in the process of music listening, that visual imagery is also experienced—that is, whilst one is *engaged* with the music. This forms the first hypothesis of the two empirical studies (see Chapter 3 and 5). The concept of engagement may be described as 'multidimensional and multifaceted' (Schubert, Vincs & Stevens, 2013:2); the definition of engagement adopted in this thesis refers to real-time engagement, associated with heightened attention and interest (Olsen, Dean & Stevens, 2014).

The variety of listening modes and experiences that may occur in response to a piece of music is summarised effectively in Herbert's (2011:1) personal account on the matter:

At any time, regardless of the context in which music is heard, I can find myself veering between 'everyday' and 'proper' modes of listening: whether at a live classical concert, at home, listening to music in a lecture or on the move, I might find myself 'wallowing' in the sound, be exposed to unbidden imagery, narratives, associations and memories, notice myself analyzing aspects of the music, experiencing my surroundings slightly differently—or even forgetting the very presence of music. Notably, my awareness can fluctuate between these ways of listening to music in a single hearing.

In this extract, Herbert discusses the spontaneous visual imagery that may emerge during music listening, as well as her dynamic levels of attention—her musical engagement—as part of the same experience; however, very little research attention has been paid to the relationship between the two. The following study attempts to address this research gap, investigating the possible link between engagement and visual imagery through the analysis of continuous self-report responses to ecologically valid musical material.

The largest body of research exploring visual imagery in music listening lies predominantly within the therapeutic domain of *Guided Imagery and Music* (Bonny & Savary, 1973). To date, empirical investigation of the phenomenon has been limited. Commenting on scientific approaches to visual imagery research, Pearson argued that 'the comparative lack of research publications is somewhat surprising, considering the ubiquity and functional relevance of mental imagery in so many of our everyday cognitive processes' (Pearson, 2014:178). This lack of research may be explained by the

internal, subjective nature of imagery and its methodological constraints, which are often subject to criticism (Ibid.). Nonetheless, a renewed interest towards visual imagery in response to music has gained ground from a variety of approaches in the past two decades (Tavernaro, 2016; Küssner & Eerola, 2017; Balteş & Miu, 2014). For example, visual imagery has been described as a key mechanism underlying listeners' emotional responses during music listening (Juslin et al., 2010), potentially revealing a link between music-induced visual imagery and engagement with the music.

1.1.1 What is Imagery?

Mental imagery plays a key role in everyday life. The way imagery is tied to thought and introspection, the process of 'looking within', suggests that imagery is important in problem solving, memory, creativity, emotion and even language comprehension (Kosslyn, Thompson & Ganis, 2006:4). The broader definition of imagery does not limit itself to the visual modality: Richardson (1969) referred to mental imagery in relation to 'all those quasi-sensory or quasi-perceptual experiences' which include any sensory, perceptual, affective or other experiential states, such as hunger or fatigue (pp. 2–3). Imagery may therefore be perceived across a varied range of sensory modalities—these are generally described as visual, auditory, kinaesthetic, tactile, olfactory, gustatory imagery and organic² (feelings and bodily sensations, such as thirst)—and not necessarily in a unisensorial manner: one type of imagery may also influence imagery or perception in another modality (Lacey & Lawson, 2013). The focus of this study is on the visual modality. Visual imagery is commonly described as 'seeing with the mind's eye'; a suitable definition indeed, considering that neuroimaging studies such as Ganis, Thompson and Kosslyn (2004) showed that the brain regions employed by visual perception and visual imagery overlap by more than 90%.

In an early, major contribution to the field, Richardson (1969) identified four broad classes of imagery (any modality): (1) after-imagery, (2) eidetic imagery, (3) memory imagery and (4) imagination imagery. After-imagery may be obtained following a prolonged exposure to the sensory stimulation. Of the four forms of imagery, it is the most dependent on the actual stimulus conditions. Eidetic imagery, unlike after-imagery, does not require a prolonged stimulus for its formation, and may be maintained for longer durations. Eidetic images are extremely vivid and clear, accurately recalling a previously perceived stimulus; these are sometimes referred to as

² The Betts' Questionnaire upon Mental Imagery (Betts' QMI, Sheehan, 1967), a test used to assess imagery vividness in different sensory modalities, includes 'organic' amongst its imagery scales. Research which makes use of Betts' QMI (such as Campos & Fuentes, 2016) uses the same terminology when referring to imagery related to bodily sensations. Contemporary literature, however, seems to adopt an alternative term, at times referred to as 'somatic imagery'. For instance, Belardinelli et al. (2009) describe somatic imagery as 'internal proprioceptive sensations', such as the feeling of fatigue (p. 191).

‘photographic memory’. It appears that only a small minority of children are capable of producing this kind of imagery, with even fewer instances in adults (Haber, 1979). Memory imagery refers to the relatively familiar imagery commonly used in everyday life. It is generally characterised by high degrees of voluntary control, often relating to memory—such as the recall of past events or other personal references. According to Richardson, these are typically hazy, brief in duration and less vivid, although for a few individuals the properties of these images may still resemble the clarity and stability of an eidetic-image. Whilst memory imagery refers to experienced occasions or seen/recognised objects through one's memory, an imagination-image may incorporate such information, yet with a propensity to be novel, vividly coloured (when in the visual mode) and involving a concentrated, quasi-hypnotic attention. It is anticipated that participants may experience any of these types of visual imagery in response to music—although memory and imagination imagery may emerge more frequently among responses.

1.1.2.1 A Look from the Mind's Eye: Visual Imagery

Throughout the majority of the daily life and activities, ‘our visual systems extract information from the visual world to ensure smooth interactions with the environment’: during perception, the brain constructs and maintains internal representations of objects or events from the visual world (Ganis, 2013:9). Such internal representations ‘can also be reactivated during visual mental imagery without the aid of any external visual stimuli’ (Ibid.:10). Visual imagery enables the reactivation and inspection of mentally represented images; these internal images may be constructed through the use of ‘fragmentary information stored in long-term memory’ (Ibid.). However, this is not uniquely the case: contrarily, it is also common to use visual imagery to extract new information, for instance by dissecting and recomposing images into new patterns and combinations (Finke, Pinker & Farah, 1989). Studies in which participants are prompted to recall or create specific images in their mind, rotating their angles, zooming in or reassembling shapes into new combinations, are frequent procedures appearing in the numerous imagery-based empirical studies (see Kosslyn, 1980; Shepart & Cooper, 1982). These certainly represent a valuable contribution towards the exploration of the complex, at times obscure, imagery domain. However, Thomas (1999) raised an understandable argument concerning the content of these narrowly focused studies, highlighting the disparity between the ‘mere visualisations’ involved in the scientific use of visual imagery and the much wider, culturally-charged functions of imagination and creative thought. The author notes that although imagery and imagination may be related by definition—imagination implying image reproduction—there is a general avoidance in scientific theories of the creative, ‘relevant’ imagination sense. Thomas continues his argument, claiming that such issues should be addressed

through a scientific theory of imagination that recognises and integrates the Romantic conception of the term.

Research has progressed since Thomas, however, and the concept of imagination has increasingly gained ground, although mostly in the wider sense of the creative construction of knowledge. Recent examples in music literature include theories around the creative thought processes involved in not only composition and performance, but also music listening (Hargreaves, Miell & MacDonald, 2012; Hargreaves, 2012); yet, even there, visual imagery in music listening remains a marginalised theme throughout the discussions. It is not within the aims of this thesis to inspect the scientific theories and perspectives argued in Thomas's (1999) work; however, the free, creative process of visual imagery will possibly find more room in the course of the following exploratory study. In sum, visual imagery responses to music have been described and explored in a variety of ways. The empirical research reported in this thesis uses the definition of 'seeing with the mind's eye', and asks participants to report any images that come into their minds as they are listening to music.

1.1.2 A Definition of Engagement

A variety of definitions fall under the wider concept of *engagement*. In the *Oxford Dictionary*, to 'engage with' is defined as the establishment of a meaningful contact or connection, occupying or attracting someone's attention ('Engage', 2010). A more detailed description by Furrer and Skinner (2003), in research exploring children's classroom engagement and performance, defines engagement in relation 'to active, goal-directed, flexible, constructive, persistent, focused interactions with [the] social and physical environments' (p. 149). A large number of educational studies refer to engagement as a multifaceted construct embracing affective, behavioural and cognitive dimensions (see, for instance, Fredricks, Blumenfeld & Paris, 2004). Behavioural engagement includes effort, attention and concentration; emotional engagement includes interest, enjoyment and enthusiasm; cognitive engagement incorporates motivation, strategy use and effort (Skinner et al., 2008; Fredricks, Blumenfeld & Paris, 2004).

Turning the attention to music-oriented literature, engagement is more commonly employed as a whole concept and less often 'unpacked' into the components explored in educational studies; though occasionally, some studies may refer specifically to *emotional engagement* by means of emotional responses to music (as in Timmers et al., 2006). Music engagement is often understood as the active involvement of music-related activities in one's everyday, cultural habits: for instance, the frequency of musical activities undertaken (Wöllner et al., 2011); trends in musical preferences and listening habits (Upadhyay, 2013; Bolden & Nahachewsky, 2014); or behavioural reactions to music

listening (de Vries, 2011). Others, however, refer to music engagement as being more closely related to the specific instance of music listening. Studies such as Lamont (2011) and Olsen, Dean & Stevens (2014) describe engagement as the induction of *flow* (Csikszentmihalyi, 1990), or absorption: a state of mind 'in the zone' and fully immersed in the performance of a particular activity or task. Importantly, this concept of engagement is not necessarily linked to a positive experience. It is the latter definition that will be of central concern in the following study: the feeling of being compelled, of being drawn into what is happening in the music, and interested in what will happen next (Schubert, Vincs & Stevens, 2013). Chapter 2 will provide an insight into the empirical findings on this topic.

1.2 Visual Imagery and Engagement: An Overview of Possible Common Ground

Relatively little research has been undertaken on the possible links between engagement and visual imagery in music listening. In spite of the limited number of studies explicitly relating the two fields, some research seems to point implicitly towards a possible imagery–engagement connection. The next section will outline an overview of the potential areas for common ground. The following discussion does not intend to establish a psychological theory; however, it aims to highlight particular facets of the listening experience that suggest an underlying link between the two areas, with a view to developing these further through future theoretical and empirical research.

1.2.1 Recent Research

An exception to the scant literature exploring the possible links between engagement and visual imagery, is a work by Tavernaro (2016). Although participants' engagement was only a small aspect of the study, the results are nonetheless encouraging. 140 participants listened to nine orchestral clips (40 seconds in duration) from nineteenth and twentieth century instrumental works under three different experimental conditions; participants were: a) provided with a text description seemingly congruent with the excerpts, b) provided with an incongruent description, and c) no description was given. When a text was provided, participants were asked to imagine the given description while listening to the music. Following the listening tasks, participants were asked to state whether visual imagery occurred, as well as to provide on a 7-point Likert-type scale the vividness of their visual imagery and time spent imagining. All participants were also asked how engaged they were with the music, their enjoyment levels and their emotional reaction. While most music listeners reported visual imagery, participants in the congruent condition were significantly

more likely to experience visual imagery than the other two conditions. Furthermore, when imagery was experienced, listeners reported enhanced engagement, higher enjoyment levels and stronger emotional responses to the music. These findings suggest that further study investigating the links between visual imagery and engagement is justified.

1.2.2 The Underlying Emotional Response in Music Listening

According to Juslin et al's (2013) theoretical BRECVEMA model, visual imagery is one of the eight ways in which music can elicit emotions. (Other proposed mechanisms are *brain stem reflexes, rhythmic entrainment, evaluative conditioning, contagion, episodic memory, musical expectancy* and *aesthetic judgement*.) This framework refers to visual imagery as a process in which an emotion is induced in a listener as a result of the close music-imagery interaction. Listeners seem 'to conceptualize the musical structure through a metaphorical non-verbal mapping between the music and "image schemata" grounded in bodily experience' (Juslin et al., 2010:622; see Lakoff & Johnson, 1980). For each of the psychological mechanisms in Juslin et al's (2010) model, findings from various disciplines are synthesised into theoretical predictions. According to the model, visual imagery's ontogenic development occurs around children's pre-school years. The mechanism is highly influenced by culture and learning, hence by one's exposure to various musical styles, and may induce all possible emotions. The model also describes visual imagery's induction speed as low, and with a high degree of volitional influence: listeners may influence the imagery process by actively conjuring, manipulating or dismissing mental images (Ibid.:623). Further properties of visual imagery include a high availability to consciousness or high awareness of the induction process (or aspects of it) from listeners; low degrees of independence as a mechanism (low modularity—hence visual imagery's induction process may be potentially activated alongside other psychological processes); and finally, medium dependence on musical structure.

Reflecting on these properties, particular features stand out as forming a potential link with musical engagement. For instance, the influence of culture is also shared with engagement: what attracts one's attention and interest in a piece of music may be influenced by culturally-specific, personal factors (Olsen, Dean & Stevens, 2014). If listeners' visual imagery may be connected to any emotional aspect, engagement can also relate to emotional factors. Examining listeners' affective responses in terms of Russell's (1980) circumplex model (a two-dimensional framework of perceived affect comprising arousal (aroused/calm) and valence (positive/negative)), Olsen, Dean & Stevens (2014) suggest that engagement can play a mediating role in such affective responses by listeners. More specifically, they showed that a continuous measure of engagement levels was a modest but statistically significant predictor in time series models of perceived arousal and valence. This was

also mostly the case when other measured acoustic parameters (intensity and spectral flatness) were included in the model.

Returning to other studies supporting a visual imagery–emotion link, the three factors which emerged from listeners' imagery in Küssner & Eerola (2017) (realistic imagery, abstract imagery and absorbing imagery) resulted in a small but statistically significant positive correlation with the 'Sophisticated Emotional Engagement' battery of the *Goldsmiths Musical Sophistication index* (Müllensiefen et al., 2014). Among the self-reported causes of emotions, in a study investigating listeners' emotional reactions to music (Juslin et al., 2008), visual imagery appeared fourth in order of frequency, representing 7% of the data. This was preceded by episodic memory (14%), brain stem response (25%) and emotional contagion (32%). Whilst the frequency of responses identifying visual imagery as emotion-eliciting is rather low, it may also be possible for participants' recall of past memories to overlap, to varying degrees, with visual imagery. If visual imagery is characterised by low independence as a mechanism in Juslin's theoretical model, it is likely that it may occur in conjunction with another mechanism. For instance, when one's emotional response to music is intense (high in arousal, Russell, 1980), this in turn could heighten the engagement with the music and trigger a visual imagery response. Therefore, the potential mediation of visual imagery and engagement by means of a listener's emotional response to music points towards a potential correlation between the two.

1.2.3 The Additional Dimension and Further Links

It may also be possible that experiencing visual imagery enhances the overall music listening experience through the addition of a further 'visual' dimension. The presence of visual imagery could increase the engagement with the music as a result of a multimodal form of engagement. Furthermore, if the music being listened to evokes certain images in the minds, that process of translating sound into images would imply a personal understanding of the music. In this respect, it is possible to relate such understanding to Hargreaves, Hargreaves & North's (2012) work on *Networks of Association*, suggesting that 'listeners create their own personal "network of association" which acts as reference points for their mental representations of their musical worlds' (Hargreaves, 2012:547).

Finally, other sources seem to further suggest an underlying connection between visual imagery and engagement. The Absorption in Music Scale (AIMS) questionnaire (Sandstrom & Russo, 2013) is a 34-item measure of one's ability and willingness to be drawn by the music into an emotional experience. It is interesting to notice how visual imagery has been incorporated in two of its

statements: 'when listening to music, I often imagine the musicians playing the songs' (n.28) and 'I sometimes see vivid images in my head when I listen to music' (n.31). This inclusion of imagery implies a connection with being absorbed in the music, hence a high musical engagement. Similarly, from the perspective of dimensions of visual imagery identified by Richardson (1969), 'imagination-imagery' is described, as mentioned earlier, as involving a 'concentrated and quasi-hypnotic attention' (p. 94).

1.3 Imagery in Music(ology)

If music-related visual imagery is perhaps not a particularly dominant research field in psychological and scientific texts—in comparison with other prominent areas of research—it is, nevertheless, a rich area of discussion in the musicological domain. Indeed, musical works are often presented with information which invites particular imagery associations. From the moment one enters a concert hall a variety of programmatic information or extramusical references of the music are often presented: suggestive titles, poem citations and detailed programme notes on asserted or believed referential intentions behind compositions. Nevertheless, these are only a partial means of conveying extramusical connotations: the most important 'clues' are embedded in the music.

Before moving further with these ideas, however, a brief clarification of the musicological and philosophical standpoint of this research should first be addressed. In particular, this will serve as a response to the possible sceptical reactions used in defence of the absolute ideology—a hot debate which, although less in evidence today, still influences a number of musicians, musicologists and philosophers. In the eyes of the absolute ideology, music should be regarded as self-dependent: an autonomous entity which does not seek external justifications or meanings. At the forefront of this ideology stands a musical 'purity' which rejects the subsidiary role which music often suffers from. Such subsidiary roles, for instance, include music 'being subordinated to words (as in song), to drama (as in opera), to some representational meaning (as in programme music) or even to the vague requirements of emotional expression' (Scruton, 2001a). Conveying a meaning which goes beyond the music itself only pushes the true essence of music to a subordinate level. Advocates of these perspectives are likely to consider the present research as somewhat controversial. According to Zangwill (2015), the urge to understand music leads the listener into the temptation of understanding it in other terms, such as emotion, representations and so on. He continues his argument claiming that 'it is crucial to resist this temptation' (p. 1). Such temptation may extend further to 'unsatisfactory ways of listening' by letting 'your fancy slip away and create all sorts of stories and pictures to fit the music' (Salter, 1950:210–11; discussed in Herbert, 2011). It is a

perfectly agreeable view that music is not necessarily understood solely as a set of emotions or uniquely through images and associations. Nonetheless, what exactly would be ‘wrong’ with emotions and associations in the first place anyway—if they are even avoidable at all? If music evokes certain reactions in its listener, these may not define the music, but nor would they diminish it. On the contrary, they can enrich it.

A different perspective may be found in an older publication by Higgins (1924), in which the author regards the key terminology of the debate overall problematic. Higgins pointed out the inadequacy of the terms ‘absolute’ and ‘programmatic’ by considering them ‘very misleading’ (p. 988). Instead, the author proposes as an alternative the substitution of the two terms with ‘formal’ and ‘representative’. In offering these new captions, Higgins intended to emphasise that such distinctions do not correspond to two distinct types of musical genres—a tempting thought, for some; a distinction of this kind would be purely superficial and, most of all, particularly subjective. Instead, these captions offer a way of referring to the features which emerge more prominently in one's (individual) music listening experience. For instance, when listening to a piece of formal (or so-called absolute) music, one may perhaps be more conscious of its formal and aesthetic qualities, as opposed to underlying extramusical ideas or referential meanings. On the other hand, representative (or programmatic) music may invite the concept or represented idea behind the music—if present—to emerge at the forefront of the listener's experience and in his or her mind. Nevertheless, regardless of one's terminology or consideration of a piece, all aspects of a musical work can contribute towards a richer listening experience.

By way of a closing remark, it is important to emphasise that the discussion set out above does not imply, in any way, that music cannot be appreciated ‘as it stands’, nor that one cannot fully appreciate music solely through contemplation of its sounds. Instead, more simply, these arguments stand as an invitation to enjoy music and welcome the experiences music brings with it whatever form these may take. It is this approach that is adopted in the current thesis, while recognising that notable musicologists and, indeed, composers (such as Stravinsky) have taken exception to this particular understanding of music.

1.4 Summary: Engagement and Visual Imagery

The present chapter pointed out potential areas of common ground between music listeners’ experiences of visual imagery and their engagement with the music. This forms the first hypothesis of the two empirical studies presented in Chapters 3 and 5. Although relatively little research

explicitly explored the relation between the two fields, recent studies are nonetheless promising. In a study by Tavernaro (2016), participants who experienced visual imagery also reported enhanced engagement with the music. Affect may also hold a potential role in the engagement–visual imagery link. According to Juslin et al.'s (2013) BRECVEMA theoretical model, visual imagery is one of the proposed mechanisms in which an emotion is induced in a music listener. Similarly, in relation to Russell's (1980) circumplex model comprising arousal (arousal/calm) and valence (positive/negative), one's musical engagement can play a mediating role in such affective responses (Olsen, Dean & Stevens, 2014). A small but significant correlation also emerged between visual imagery and the 'Sophisticated Emotional Engagement' battery of the *Goldsmith Musical Sophistication Index* (Müllensiefen et al., 2014), in a study by Küssner and Eerola (2017). Further sources implicitly suggest an engagement–visual link; for instance, the way two questions from the Absorption in Music Scale questionnaire (Sandstrom & Russo, 2013) concern the experience of visual imagery. Likewise, Richardson's (1969) description of 'imagination imagery' involves a concentrated, quasi-hypnotic attention. Finally, further considerations include the possibility of an enhanced music listening experience—and higher engagement—as a result of the additional 'visual' (imagery) dimension, as well as the shared influence of culture on both visual imagery and engagement with the music. To contextualise the discussion further, the ensuing chapter will provide a critical overview of relevant research on music, engagement and visual imagery.

Chapter 2. On Music, Engagement and Visual Imagery: Reviewing the Literature

Chapter 1 identified empirical research and theoretical works which point towards a potential engagement–visual imagery relationship. The present chapter is formed of two sections: the first reviews literature which individually investigates engagement and visual imagery in music-related research contexts; the second momentarily diverges from musical discussions, outlining some of the exceptional experiences involving visual imagery. More specifically, it offers a brief review of synaesthesia, congenital aphantasia and mind wandering, and considers their possible relevance to the current research.

2.1 A Question of Engagement

2.1.1 Engagement in Music Listening

In a study by Thompson (2007) investigating factors which contribute towards listeners' enjoyment of a live music performance, engagement emerged as the most commonly reported. The extent to which performers were seen to be engaged in their own playing, as well as listeners' engagement with the music, appear to play important roles in this. Engagement is a multidimensional construct (Olsen, Dean & Stevens, 2014), and investigations as to what raises and maintains a listener's interest are still on-going. Existing literature proposes some suggestions. With regards to live performances, audiences seem to engage more with 'projected' performance conditions, as opposed to a 'deadpan' execution of the piece (Broughton, Stevens & Schubert, 2008). A recent study by Broughton et al. (2019) showed that note density³ and sound intensity contributed significantly to listeners' engagement responses to an atonal marimba work; whilst musical repetition, surprisingly, did not. Thompson (2006) suggests that concertgoers' retrospective ratings of affective engagement⁴ are a significant predictor of enjoyment, and a better predictor than perceived quality of the performance. In addition, a study by Olsen, Dean and Stevens (2014) shows that listeners' engagement can play a mediating role in perceived affective responses—most likely serving as a mediation of the relationship between the music's acoustic parameters and listeners' emotional responses (p. 152). What engages us in a piece of music can be dependent upon

³ Density defined as 'the number of sequential sound onsets within a defined time frame' (Broughton et al., 2019:112).

⁴ A variable formed by collapsing 'engagement' and 'emotionally moving' variables into a single one.

numerous personal and cultural factors. A common area of agreement, however, is that engagement varies and fluctuates. At times, music can fully occupy one's attention; at other moments, music can be relegated to the background as mere 'sound wallpaper': one's engagement can lie at any point between these two extremes (Gabrielsson, 2011). On the high end of the scale of engagement, Gabrielsson's (2011) *Strong Experiences with Music* provides an insightful account which gathers a variety of qualitative supporting data.⁵ Strong experiences in music (SEMs) are sometimes described as peak experiences, characterised by becoming totally absorbed with a phenomenon, forgetting about time and space, and experiencing a special fusion with the phenomenon, all combined with strong feelings (p. 3).

Building on the work of strong experiences in music (SEMs), Lamont (2011) thematically analysed free reports provided by 46 university students (with a mean age of 21 years) of their most intense music listening experiences, specifically in relation to theories of happiness and subjective wellbeing. Most strong experiences emerged as positive; furthermore, in line with Seligman, Parks and Steen's (2005) concept of balanced wellbeing, each account included references to (1) hedonism, the pursuit of pleasure; (2) engagement, or a quest for gratification through absorption in an activity; and (3) meaning, particularly with regards to identity and a search for a 'meaningful life' (Figure 1).

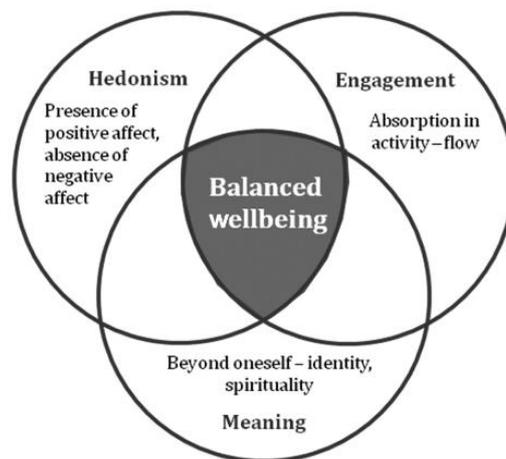


Figure 1. Extracted from Lamont (2011): Figure displaying a balanced approach to wellbeing, drawing on Seligman's framework (Seligman, Parks and Steen, 2005)

Music's potential to evoke pleasurable experiences is also supported by brain imaging studies, since music stimulates the brain regions linked to arousal, emotion and motivation, such as the ventral striatum, midbrain, amygdala and orbitofrontal cortex amongst others—regions also stimulated in response to other euphoria-inducing stimuli, such as food, sex or drugs (Blood & Zatorre, 2001). According to Lamont's (2011) study, SEMs appear to be predominantly experienced in live listening

⁵ These will also be later discussed, in relation to visual imagery.

contexts (78.3% of the sample); 17.4% occurred during recorded music listening, whilst in two cases (4.3%) SEMs emerged during an imagined listening experience to previously heard music. Familiarity was also an influential component, since these experiences frequently occurred whilst listening to familiar music (35 out of the 45 responses given). To some participants, subsequent listening to the same music seemed to evoke the same response (35%), although for others this was less intense (37%). The duration of these experiences varied across participants, ranging from a few seconds or occurring at specific moments in the music, to the entire duration of a set being played. A widely shared theme among participants' descriptions was the experience of flow-type states, or a complete focus on the musical experience. One participant reported: 'It felt like nothing was happening outside the building, everything was in here, nothing else mattered for that 45 min set' (p. 237). Despite the predominantly positive responses linked to the strong experiences reported, recent studies also suggest that pleasure can also be evoked through sad music, in that the intensifying feelings of being moved can contribute towards its enjoyment (Vuoskoski & Eerola, 2017).

As mentioned earlier, musical engagement develops and unfolds alongside the music through time. Herbert (2011:189) discusses more broadly the complexity of the human mind during music listening, and the incessant alteration of listening states:

Concentrated and directed and casual and distracted ways of listening do not map neatly onto special (unusual) and ordinary (mundane and habitual) contexts nor relate consistently to general levels of musical engagement. Music may be experienced with an absorbed attentive focus one moment and a bare awareness of its presence the next, whether it is listened to in a concert hall or at a bus stop, and whether the person doing the listening is a professional musician or only mildly interested in music.

Indeed, a listener may experience an array of engagement levels within the frame of a single music listening experience. In order to observe such fluctuations, the two empirical studies in this thesis (presented in Chapters 3–5) captured continuous self-report responses, enabling a closer insight into the unfolding of a listening experience.

2.1.2 Engagement Mapped through Continuous Self-Report Measures

Studies exploring engagement or absorption often investigated listeners' responses through written accounts of their experiences, varying from free, retrospective reports (such as Lamont, 2011) to questionnaires or likert-scale ratings (Sandstrom & Russo, 2013; Tavernaro, 2016). Collectively, such accounts provide important insights; yet, there is only a certain degree of depth that these methods are able to capture, bearing in mind the fluctuating nature of the listening experience. An increasing

number of studies therefore adopt continuous self-report measures to investigate live responses to music listening. As Timmers et al. (2006) pointed out, albeit in relation to emotional engagement, 'the use of continuous measurement provides the possibility of zooming in and investigating the relation between music and emotional response locally' (p. 482).

Studies making use of continuous ratings have adopted a variety of approaches and interface equipment: these often involve computer based tasks, where the cursor displayed on the screen is continuously adjusted in relation to a set scale, such as bi-dimensional models—studies employing this approach include measurements of perceived arousal and affect (Dean, Bailes & Schubert, 2011; Bailes & Dean, 2012) and levels of engagement during music listening (Olsen, Dean & Stevens, 2014), to name a few. In the context of live performances, continuous engagement responses are generally gathered via portable Audience Response Facilities (pARFs; as in Broughtoun et al., 2019; or Brighton, Stevens and Schubert, 2008); with the use of a stylus and a touch-sensitive screen, participants are able to rate their engagement responses from the comfort of their concert hall seat. Beside touchpads, recent technological developments enabled the implementation of a wide range of alternative devices, from Wii remotes to other haptic technology.

Selecting the most appropriate experimental interface is important to optimise the compatibility between the recorded dimension and the nature of the response (Stevens et al., 2014). In the context of the present study, the use of a screen could form a visual distraction—a suitable approach for measurements of engagement, yet one that could potentially interfere with participants' imagery experiences. The use of a slider was deemed more suitable as it allows participants to close their eyes at will whilst the task is being performed; this method enabled participants to gain a sense of the upper and lower extremes of the rating scale without need of further visual cues.

2.2 Music and Visual Imagery

2.2.1 Imagery in Music Therapy

Visual imagery in music listeners has been predominantly explored within the domain of music therapy. A particularly prominent practice in the field is Helen Bonny's *Guided Imagery and Music* (GIM): a method of psychotherapy where clients, following a preliminary process of deep relaxation, are invited to share their images of an imaginary traveller as they listen through a carefully programmed musical sequence; throughout the session, the therapist maintains an active dialogue, providing encouragement and focus as thoughts, images and emotions emerge (Goldberg, 1995:112).

The music employed in GIM sessions focuses on Western works, including composers such as Debussy, Vivaldi, Vaughan Williams and Bach. These musical sets generally consist of 30–40 minutes of music, and are divided between ‘general use’ and ‘specific’ programmes, the latter designed for specific therapeutic uses (Ibid.:117)—such as the ‘Comforting’, the ‘Grieving’ or the ‘Affect-Release’ programme. Some of Bonny's criteria for selecting the music emerged in an interview by Nicki Cohen (2005:1):

...Because I'm a classical musician, I look for the dynamics within the music and how the music is structured. (...) I learned that the way the music is written is very important, and that the thematic segments should be understandable. By that, I mean that there should be interesting repetition. Repetition helps to keep a person in an imagery space. Variations give a person different ideas of what that space is, so sometimes a theme and variations are used. I'm thinking of the [Bach's] *Passacaglia and Fugue* in the Mostly Bach [program]. One of the problems with modern day or new age music is that it wanders around, which keeps you on the surface and doesn't help you go more deeply in the music.

Bonny continues, explaining how strong chordal progressions should also be accessible for the listener: dissonances are acceptable, yet a good harmonic foundation is required. A similar balance applies to dynamics; crescendos do help emotional build-ups towards peak experiences, but necessitate a resolution. She states, ‘consider the Wagner [opera] *Tristan und Isolde*. It's beautiful, but if you listen to the build-up, it just goes on and on. It can totally wear a person out’ (p. 2). Interestingly, Bonny expresses a preference for instrumental works over songs, on the grounds that ‘words may not be in synch with the [person's] experience’ (Ibid.). Bonny's selections appear to be based predominantly on her own personal experience as therapist, musician and music listener. The music–imagery combination emerged as a powerful therapeutic tool, and has been shown to promote positive psychological and physiological health outcomes in adults (McKinney & Honig, 2017).

Other sources from the field provide a variety of insights into both listeners' visual imagery experiences, and the role of the musical works used. Band (1996), for instance, explored the effects of structured versus unstructured inductions on imagery and the influence of different musical works. Music selection was restricted to two, very different, musical works (orchestral transcriptions were used in both pieces): Bach's ‘*Little Fugue in G-Minor*’ and Debussy's *En Bateau*, from *Petite Suite*.

Following an initial progressive relaxation, 317 undergraduate students were randomly assigned to one of six experimental conditions: structured or unstructured imagery induction, and music (Bach or Debussy) or silence. At the end of the sessions, participants completed a number of

questionnaires, which included questions about imagery content. Results revealed a significant main effect of music's presence: music enhanced various aspects of the imagery experience, increasing the imagery's vividness, as well as increased levels of absorption (ratings were provided by marking a visual analogue scale), as opposed to the condition of silence, results which, once again, provide supporting evidence that visual imagery may be experienced with increased engagement levels during music listening. Not many differences emerged across the two induction conditions, with the exception that the structured condition had a greater influence on the content of the images reported. It should be noted, however, that participants from both structured and unstructured conditions were provided with an initial visual image to be subsequently developed (that is, '...See yourself standing at the edge of a forest. Look around you and notice any colours... any sounds... or any smells', etc. (p. 95). Interestingly, the choice of music did not appear as influential as its presence or absence (silence).

The way music facilitates visual imagery has also been confirmed in other studies: Quittner and Glueckauf (1983) reported a significantly higher imagery production in their music listening condition, as opposed to the control or progressive relaxation conditions. The study also employed the *Creative Imagination Scale* (CIS) (Wilson & Barber, 1978), a measure of imaginative suggestibility (e.g. imagine a finger becoming numb or eating a delicious orange). Findings showed that subjects with higher CIS scores conjured up more vivid images and spent more time imagining, as captured by an event recorder button pressed by participants as imagery was perceived, in addition to overall ratings provided on a 5-point likert scale (Quittner & Glueckauf, 1983).

McKinney (1990) also found that higher CIS scores corresponded to higher imagery vividness (any modality) ratings. In this study, 81 undergraduates (with a mean age of 20) were encouraged to imagine seeing themselves in a meadow. This was followed by silence for the control group, and a short musical excerpt (Vaughan Williams' *Rhosymedre*, 3 minutes and 55 seconds) for the experimental condition. Surprisingly, this study reported a lack of effect of music, with no significant changes in terms of vividness, imagery activity or types of imagery. Imagery vividness and imagery activity were self-rated by participants, supported by a score provided by two raters analyzing participants' written responses—the latter, perhaps, a particularly subjective addition, due to the possible degrees of uncertainty around participants' inability or difficulty in expressing their imagery experiences in greater details. Furthermore, the extent of the visual imagery experienced was somewhat lost in the coding, which focused on imagery categories explored within GIM practices (such as 'transpersonal' or 'healing'). The data from this study was subsequently re-analysed in McKinney and Tims (1995), this time dividing participants into two groups: high and low imagers.

Findings suggested that high imagers imagined more vividly and actively than low imagers during music listening; and that music increased kinaesthetic imagery for both groups. The researchers concluded that music can have both broad effects on listeners' imagery, regardless of one's imagery abilities, as well as differential effects (such as vividness) in line with the person's imagery abilities.

2.2.2 Visual Music and Visual Imagery

Beyond the therapeutic domain, other empirical investigations on music and visual imagery range through a variety of settings and scopes. Visual imagery is often explored as part of a broader study but, sometimes, the research focuses on very specific—occasionally narrow—aspects of the listening experience. A number of studies looked at the relationship between specific sounds and their imagined visual equivalent: Eitan and Granot (2004), for example, explored the link between musical parameters and imagined physical movements. After listening to brief musical extracts, participants were asked to specify the direction and pace of the imagined movement. Results presented some surprising findings: opposite musical parameters were not symmetrical in the imagined direction; a *diminuendo* moved away and descended, yet a *crescendo* did not ascend, but sped up. Overall, both musicians and non-musicians provided similar responses. Whilst these findings are insightful, the study constrained itself to the sole use of fragmented, tonally ambiguous musical extracts—overall, a particularly artificial ‘music listening’ experience. It would be intriguing to explore the extent to which such associations might emerge from spontaneous visual imagery experiences in relation to integral musical works. After all, ‘music is the sum of its parts and is experienced over a temporal continuum’ (Aiello, 1994:273)—an experience which moves considerably beyond the rather artificial music stimuli described above.

Tan and Kelly's (2004) study undertook a broader approach, exploring listeners' ways of capturing a musical work visually. 60 undergraduates were asked to visually represent five short, yet complete, orchestral compositions (musical works included Copland's *Jubilee Variations* and Saint-Saën's *Fossiles*). Each piece was played twice: the first hearing enabled participants to gain an overall sense of the composition; in the second, participants were given the instructions to ‘make any marks to visually describe what you are hearing (that is, to capture any characteristics or features in the music you hear)’ (p. 195), as well as to provide written accounts describing the annotations made. Data collected showed a propensity on the part of musicians towards the creation of abstract, non-pictorial representations which focused on structural aspects of the music, such as phrases, tonality, sections or repetitions; non-musicians, on the other hand, were more likely to focus on their emotions and sensations, and associate musical works with pictorial images and narratives (see Table 2 for further details).

Table 2. Table extracted from Tan and Kelly (2004), showing significant findings for content analysis of participants' verbal descriptions of their annotations.

Musical Feature	N = 30 Trained	N = 30 Untrained	Chi-squares ¹
Theme/motif	15	1	$\chi^2 (1) = 14.40, p = .0001$
Repetition	25	8	$\chi^2 (1) = 19.46, p = .0001$
Section/segment	15	6	$\chi^2 (1) = 5.93, p = .015$
Major/minor mode	11	0	$\chi^2 (1) = 11.13, p = .0001$
Change in pitch/register	26	17	$\chi^2 (1) = 5.25, p = .022$
Name of instrument(s)	27	19	$\chi^2 (1) = 4.565, p = .033$
Layering/interplay of parts	16	6	$\chi^2 (1) = 7.18, p = .007$
Arousal of emotion/sensation	16	24	$\chi^2 (1) = 4.80, p = .028$
Single/unconnected image(s)	7	15	$\chi^2 (1) = 4.59, p = .032$
Continuous story line	7	15	$\chi^2 (1) = 4.59, p = .032$

¹Chi-squares with correction for continuity were reported for all cases in which lowest expected frequency was under 10 (theme/motif, mode, pitch/register, and naming of instruments).

Overall, around 30% of data involved pictorial representations, with the remaining 70% shared between abstract-continuous, such as continuous lines or linear appearance of symbols left to right; or abstract-discrete, which included a variety of symbols, such as shapes or dots, to portray many discrete musical events (an example of each category may be observed in Figure 2). Despite the different representational choices adopted by the musically trained/untrained groups, these findings do not rule out the possibility of pictorial kinds of imagery being experienced by musicians. Their tendency to focus on analytical aspects of the music may derive, instead, from a more literal interpretation of the given instructions to ‘represent’ the music—and not, as the authors suggest, by means of ‘the values that they have been taught’ (p. 207) in considering music as an end in itself (Hanslick, 1986). Furthermore, the high number of musicians referencing pitch and instrumental changes in their annotations seems to reflect the features typically encountered on a Western musical score. Yet, overall, such representations may have captured some of the participants' perceptually striking features in response to the music.

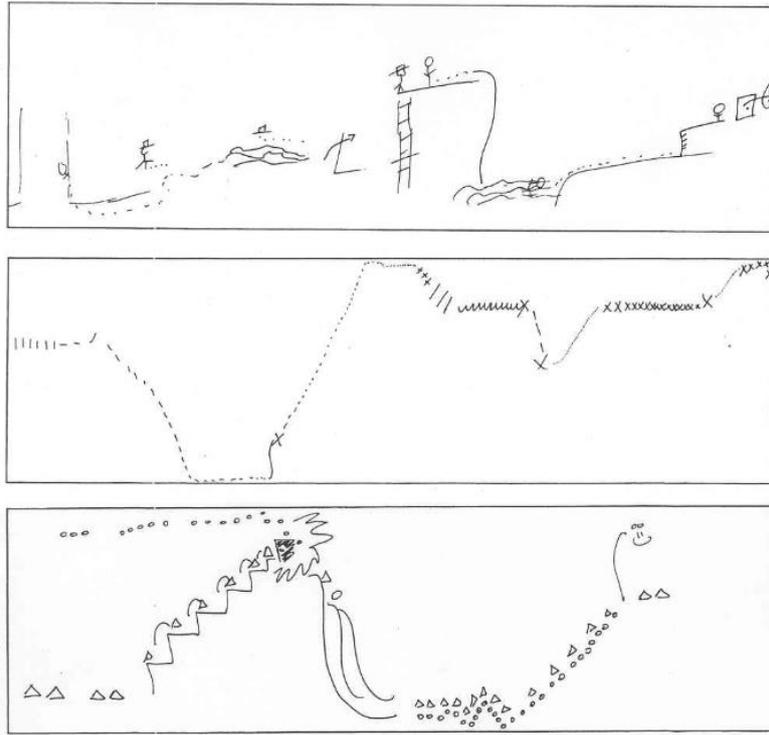


Figure 2. Figure extracted from Tan and Kelly (2004), showing three participants' representations of Copland's *Jubilee Variations*. Top, central and lower image were respectively classified as pictorial, abstract-continuous and abstract-discrete representations.

The formation of narratives during music listening was a prominent response in an earlier investigation by Osborne (1981). This study explored listeners' free responses to music: following an initial relaxation exercise, a total of 43 participants listened to a selection of synthesized electronic music whilst lying supine on the floor. At the end of the listening experience, participants were asked to provide written, retrospective accounts of any reaction they experienced to the music. Four categories emerged from the data's content analysis: 'thoughts' (abstract ideas, e.g. "the music seemed disjointed"); 'emotions' (positive or negative hedonic tones, e.g. "I felt frightened"); 'sensations' (bodily sensations affectively neutral, such as "my body felt heavy"); and 'images' (mental pictures but not confined to the visual modality, including responses such as "I heard a choir singing"). One might, however, argue that there is potential crossover between sensations and imagery. Findings showed significantly greater imagery responses than any of the other categories, which did not significantly differ from each other. In terms of imagery content, Osborne (1981:136) reported:

The written reports were usually idiosyncratic narratives. However, there were several recurrent imagery themes, such as nature scenes (sun, sky, ocean, plant and animal life); out-of-the-body experiences (floating above the earth, cosmic journeys); and religious images (God, death, judgement). Bipolarity was a feature of some image themes (light-darkness, fear-escape to happiness, levels of reality-unreality).

The study's participants had a mean of more than 5 years of musical education and/or experience; whilst exact numbers are not reported, the sample seemed to involve rather musically sophisticated listeners. The study did not specify what proportion of the imagery theme was attributed to the visual modality; nonetheless, the frequent recurrence of imagery and narrative responses challenges Tan and Kelly's (2004) findings on musicians' lack of pictorial associations with the music.

2.2.3 Recent Findings

A recent, renewed interest in visual imagery and music has given rise to new explorations on the subject. The prevalence of visual imagery in music listeners was also recently explored by Küssner & Eerola (2017), in an online survey ($n = 146$). 66.44% of participants reported experiencing visual imagery during music listening, with only 6.16% reporting never experiencing visual imagery when listening to music (27.40% did not respond). The study reported three factors which emerged from participants' visual imagery descriptions, accounting for 62% of the variance: realistic imagery (real-world scenes, such as landscapes or people), abstract imagery (e.g. abstract shapes or colours) and absorbing imagery (relating to absorption or relaxation states; e.g. 'the images... make me feel calm'). A small positive significant correlation was present between the Vividness of Visual Imagery Questionnaire (VVIQ) scores and realistic imagery, as well as the absorbing imagery, but not with the abstract imagery factor.

Visual imagery during music listening has also been associated with increased emotional experiences. For instance, a recent study by Day (2018) proposed visual imagery as emerging from listeners' emotional experiences (findings uniquely based on participants' subjective, retrospective reports of which of the two, imagery or emotions, occurred first). Balteş and Miu (2014) investigated the influence of selected individual differences traits, including visual imagery, on music-induced emotion. 122 participants were asked to report their music-induced emotions through the use of the Geneva Emotional Music Scale (GEMS; Zentner, Grandjean & Scherer, 2008), during a live performance of Puccini's *Madama Butterfly*. Findings showed that participants with a disposition towards experiencing more vivid visual imagery (based on VVIQ scores; Marks, 1973), experienced more unease and chills, in particular during the second act: at this point of the opera, emotions such as sadness or tensions are likely to relate more to the particularly evocative lyrics than to the events taking place on stage.

Considering the way music-induced visual imagery is frequently associated with emotions across various studies (Juslin & Västfjäll, 2008; Balteş & Miu, 2014; Vuoskoski & Eerola, 2015), it is not surprising to find a dedicated chapter on 'Inner Images' in Gabrielsson's (2011) 'Strong Experiences

with Music'. This chapter reports a series of personal accounts concerning imagery experiences in any sensory modality and, once again, links between visual imagery and high levels of engagement can be found. One participant, for instance, gave the following account of the imagery evoked by a particular multimodal experience: 'I became absorbed in the music, and felt as if I was being carried along on waves. (...) Then memories started to surface. Experiences of bomb shelter, the darkness, the dampness of wet steam and the body heat of someone who sat right next to me in the bomb shelter' (p. 111). Another participant questioned how the music can make him 'so spellbound' and described how it 'really grabs' him, as a result of his rich, multimodal imagery experience. In another case, this time from a performer's perspective, imagery experiences whilst performing the first movement of Stravinsky's *Rite of Spring* are shared (Gabrielsson, 2011:115):

I had never heard this fantastic piece before. (...) I remember that during this piece I was totally devoured by the music and I can still feel how I shivered all over. I sort of disappeared from the concert hall (...) It felt as if I found myself in a large, dark, fantastic fairy-tale forest. The experience was so powerful that I really was devoured by the music but nevertheless managed to stay sufficiently concentrated on my cello playing.

Whilst Gabrielsson does not develop further any themes or theories from the imagery accounts reported, he questions whether so-called programme music may be successful in conveying the composer's intentions. On this matter, the second empirical study of this thesis (Chapter 5) will address this question through the use of the musical works' epigraphs. The following section will examine existing literature concerning the use of extramusical information and visual imagery experiences.

2.2.4 Programme Notes and Dramaturgical Details

Zalanowski (1986) investigated the effects of listening instructions on music appreciation. The music used for the study involved a three minute selection of 'programmatic music' for the first session (Berlioz's *Symphonie Fantastique*, fourth movement), and an 'absolute music' selection for the second session (three minutes from Schubert's Symphony No. 8, second movement). In the first session three groups of participants ($n = 20$ per group) were each assigned different instructions prior to listening: a pay attention task ('please listen [to the music] carefully'); an imagery task ('listen carefully for any aspects of the music which may suggest imagery (...) and try to develop these images as fully as possible'); and a programme task ('try to identify the different themes and try to form mental images which are suggested by the story'). The second session replaced the descriptive programme with two new conditions, both involving analytical descriptions of the music:

one verbally delivered, the other in the form of a written programme. Participants were then asked to rate, on a scale of 1 to 10, their attention to the music, their enjoyment and musical understanding. Additionally, a memory/recognition test was completed one week later, comprised of short 10-second extracts of both previously played and new music. Results indicated significantly greater enjoyment ratings by participants in the imagery condition, as opposed to the programme condition; whilst understanding was greater in the Berlioz programme condition. Conversely, as displayed in Table 3, Schubert's analytical programme scored lower mean ratings for understanding compared to Berlioz's narrative-oriented programme. Furthermore, the type of programme also appeared to influence participants' imagery: both Berlioz's imagery and programme conditions led to a significantly higher number of mental images reported than the 'pay attention' condition; instead, the analytical programmes used in the Schubert—the concrete programme in particular—resulted in the fewest mental images (although this difference was not statistically significant).

Table 3. Table extracted from Zalanowski (1986), displaying mean ratings of attention, enjoyment, understanding ratings and memory scores for the two music selections ('abstract' refers to the verbal programme).

	Berlioz			Schubert			
	Pay Attention	Imagery	Programme	Pay Attention	Imagery	Abstract Programme	Concrete Programme
Attention	8.15	8.10	7.75	7.67	8.08	7.50	7.08
Enjoyment	6.70	7.60	6.05	5.67	6.75	6.25	6.25
Understanding	4.45	5.55	6.85	5.50	5.00	4.58	4.58
Memory	7.00	6.48	7.63	8.46	8.21	7.71	7.71

This study therefore suggests that music including 'programmatic' content can enhance a listener's understanding of the music, as well as their imagery experience. The way 'dramaturgic details' can influence listeners' perceptions of a musical work is also explored in Leigh Landy's Intention/Reception project (2006), although specifically in relation to electroacoustic compositions. As mentioned earlier, the introduction of the composer's articulation of intent—whether involving the work's title, the inspirational sources, or the elements intended to be communicated—can facilitate the music's accessibility and appreciation. As one may expect, listeners' reactions to such information nonetheless varied: 'while one listener complained that the intention information left no room for individual thought, others were able to make sense of the piece as more "physical" and felt that this information allowed for greater visualization' (p. 46). However, as the authors conclude, 'there is more to art than the work itself', and all the information surrounding a piece of work, including its means of presentation, should be considered (p. 50). A study by Vuoskoski and Eerola (2013) suggests that extramusical information can also contribute to the emotions induced by the

music, potentially as a result of narrative descriptions enhancing emotions through the visual imagery mechanism—as suggested by Juslin and Västfjäll (2008). In the study, 80% of the sample reported imageries that related to the narratives provided (both in the sad narrative and the neutral narrative; the first concerning war, and the latter nature-related).

The second empirical study of this thesis (Chapter 5) will explore more closely the role of extramusical information on listeners' spontaneous visual imagery experiences. Indeed, as suggested above, such information is likely to have an influence on listeners' perception of a musical work. Nonetheless, as observed later, it is also likely that the music itself will play an important role in the mental images created.

2.3 Special Experiences: On Visual Imagery

2.3.1 Synaesthesia

It was when I was eleven, and working on the F sharp major Prelude from the first book of Bach's Well-Tempered Clavier. I perceived something that was very bright, between red and orange, very warm and vivid: an almost shapeless stain, rather like what you would see in the recording control-room if the image of sound were projected on a screen. But as numbers had always had colours for me (...) I didn't regard this as unusual. (...) Certain pieces always project me into a particular colour-world. Sometimes it's a result of the tonality—C minor is black, and D minor, the key that has always been closest to me, being the most dramatic and poignant, is blue.

(Helen Grimaud, interview, 2004)⁶

Seeing music as colours (chromesthesia), as described above by the French pianist Grimaud, is only one of the numerous permutations in which synaesthesia may occur: alphabetical letters may be seen as colours (grapheme-colour), numbers may be organised in different spatial locations (spatial sequence) and a particular sound may create a sense of heat at the feet (auditory-tactile). Even different names may be accompanied by a delicious taste or have an unpleasant, metallic flavour (lexical-gustatory). Possible combinations of the senses are extremely broad: Day (2005) indicates 35 forms of synaesthesia, based upon 572 cases from previous publications; whilst Brang and Ramachandran (2011) report that at least 60 different forms have been documented.

The term synaesthesia derives from the Greek term 'σύν' (syn), meaning 'joined,' and 'αἴσθησις' (aisthēsis), 'perception', describing a condition in which the stimulation of one sensory modality involuntarily causes a simultaneous, additional sensation which may or not be in the same sensory

⁶ Interview published online as part of Helen Grimaud's *Credo* album release; see 'Insights' section at <deutsche Grammophon.com/gb/cat/4717692>.

modality (Specht, 2012). Synaesthesia may pair any of the senses with another, but is not restricted to this; other non-sensory variants may also involve higher-level constructs such as emotional states, thoughts, personality traits, and so on (Simner, 2012). Such experiences may occur in external space ('projectors'), such as colours overlapping onto real objects in one's vision, or as intense impressions in the mind's eye ('associator'), as reported by Dixon, Smilek and Merikle (2004). This relatively rare phenomenon appears at a prevalence of around 4% within the normal population (Simner et al., 2006), although incidences appear to vary across publications. The exact origins of synaesthesia, however, are still unclear. Different schools of thought have given rise to several theories. Maurer (1997), for instance, suggested that all babies may be synaesthetic: sensations in infants are interlinked, but are normally lost by most people with growth, when senses are processed independently; synaesthetes, however, retain these connections. Other findings support the view of a genetic predisposition (Specht, 2012), which may 'cause the development of, or failure to prune, atypical projections between otherwise unassociated regions' in the brain (Simner et al., 2006:1024). Other research notes general differences in the brains of synaesthetes, when compared to those of non-synaesthetes (Dovern et al., 2012); and suggests that the condition runs in families (Barnett et al., 2008).

An ongoing debate questions whether synaesthesia could be regarded as the extremity of a continuum: Eagleman (2012) proposes this as a way of capturing more effectively the possible, varying nuances of different synaesthetic experiences—those middle-ranging scores which, if accepting the binary all-or-none threshold employed by customary tests and analyses, would be otherwise discarded. Eagleman cites a study by Rouw and Scholte (2007) in favour of his argument: 18 grapheme-colour synaesthetes answered questions from a newly developed test to differentiate associators from projectors; their results formed a smooth spectrum, as opposed to a bimodal distribution. Similarly, Simner (2012) also emphasises the condition's broad range of manifestations, supporting the continuum hypothesis: 'synaesthesia may represent a continuum rather than a bounded category, along which synaesthetes gradually merge into non-synaesthetes' (Simner, 2012:24). Whilst considering synaesthesia as a continuum could possibly capture greater degrees of synaesthetic experiences, placing non-synaesthetes at the opposite end can, however, create some discrepancies.

Indeed, as previously pointed out by Craver-Lemley and Reeves (2013), both synaesthesia and imagery commonly share certain features: Richardson's (1969) description of imagery may also be applied to synaesthesia, for instance—a quasi-sensory or quasi-perceptual experience which can occur in any sensory modality. Yet, perhaps most importantly, other aspects such as vividness,

controllability and content specificity, markedly differ and fail to lead to a continuous distribution along a spectrum (Deroy & Spence, 2016). Whilst synaesthetes are associated with superior visual imagery skills to controls (Barnett & Newell, 2008), imagery experiences outside their synaesthetic episodes are generally not described as perceptually real; neither are they considered as analogous to their mental imagery by synaesthetes themselves (Deroy & Spence, 2015). Visual imagery is typically characterised by high degrees of voluntary control: one may consciously decide to create an image in the mind's eye or to end it. This, however, is not possible for a synaesthete; their concurrent experience (their additional experience) may be triggered by imagining the inducing stimulus, but not prevented when prompted (Craver-Lemley & Reeves, 2013). Synaesthesia tends to be, to a certain degree, 'automatic' and systematically experienced in terms of its concurrent experience—just like Helen Grimaud's colour responses to music tonality.

Therefore, this thesis shares Craver-Lemley and Reeves' (2013) assertion that imagery and synaesthesia would be best considered as two related, but distinct, mental processes: 'unlike perception, synaesthesia is not veridical: it does not provide information about the state of affairs in the world. Imagery, however, provides both near-veridical remembrance of things past and entirely imaginary or dreamlike events' (p. 202). Only one music-colour synaesthete participated in one of the two empirical studies reported here (Study 2, Chapter 5). As discussed later, results from this participant have been included in the sample, as a result of the broader variety of visual imagery experienced in each of the music listening tasks—that is, mental images which were not limited to the participant's synaesthetic repertoire.

2.3.2 Blind in the Mind: Congenital Aphantasia

In the mind of a habitual imager, the various forms and uses of visual imagery—from memory recalls to imaginative creations—are likely to be considered common experiences accompanying everyday life. Not everyone, however, may relate to such experiences: the formation of mental images is not necessarily within everyone's capabilities. The marked disparities in people's abilities to imagine were already noticeable in Galton's renowned breakfast-table survey (1880): whilst some participants were able to imagine their early meal's setting 'perfectly clearly' and 'as an actual scene' (p. 304), for others the task was considered impossible. As Galton (1880:302) reported:

To my astonishment, I found that the great majority of the men of science (...) protested that mental imagery was unknown to them. (...) They had a mental deficiency of which they were unaware, and naturally enough supposed that those who were normally endowed, were romancing.

Zeman, Dewar and Della Sala (2015) proposed the term *congenital aphantasia* for what they described being a poorly recognised phenomenon: 'blind imagination'. More specifically, the term is defined as 'a condition of reduced or absent voluntary imagery' (p. 379). Their research paper emerged in response to twenty-one individuals who contacted the authors also identifying themselves with the same imagery impairment. These contacts were made following an article (a popular adaptation of Zeman et al., 2010; by Zimmer, 2010) describing a 65-year-old man's loss of visual imagery abilities after coronary angioplasty. However, in these cases, an important difference lay in the way their aphantasia had been, instead, lifelong. Of these respondents, the majority were male (19/21); approximately half the group expressed all modalities of imagery being affected by this condition (10/21), and 5/21 individuals reported affected relatives. Despite a substantial deficit in voluntary visual imagery, some nonetheless reported experiencing involuntary imagery, either in the form of flashes during wakefulness (10/21) and/or during dreams (17/21). Furthermore, a large number of respondents (14/21) identified 'compensatory strengths' in other domains, such as verbal, logical or mathematical skills—for instance, a task that would generally require imagery to be performed (such as counting the number of windows in one's house), may still be achieved through what participants described as 'knowledge', 'memory' or 'subvisual' models.

The authors pointed out the way some of these findings, such as the male predominance in this sample, were likely to relate to the original article's readership, and resulted from participants' self-selection. Nonetheless, they suggested aphantasia as a possible neuro-psychological functioning variant similar to congenital prosopagnosia (Grüter et al., 2009) and synaesthesia (Barnett & Newell, 2008), conditions associated respectively with unusually low and unusually high VVIQ (Marks, 1973) scores. Predictably, participants with aphantasia scored significantly lower in imagery vividness than the 121 participants from the control group (Figure 3). Similarly, Keogh and Pearson (2018) reported impairments by aphantasics in various visual imagery measures, but significantly higher ratings for spontaneous use of spatial imagery (measured by the Object and Spatial Imagery Questionnaire; Blajenkova, Kozhevnikov & Motes, 2006) than the control group (see Figure 4 for a question sample from the test)—although, arguably, participants could also reach the correct answer through the use of other strategic knowledge, rather than through an imagined rotation.

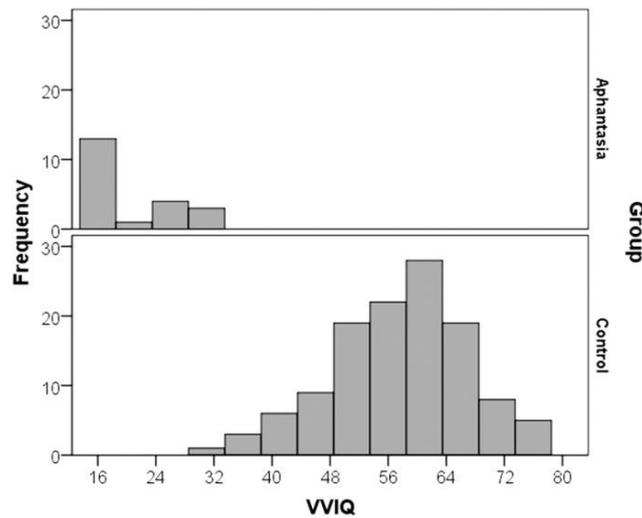


Figure 3. Graph extracted from Zeman, Dewar and Della Sala (2015). Participants with aphantasia (top graph) and 121 control participants' distribution (bottom graph) of Vividness Visual Imagery Questionnaire (VVIQ) scores (lowest imagery score = 16, highest score = 80).

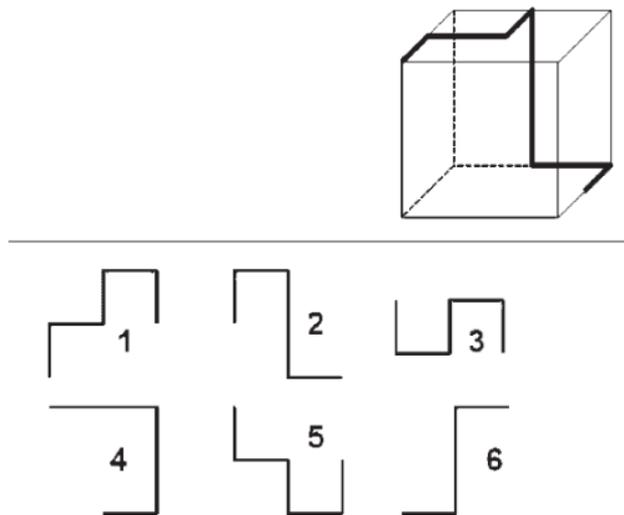


Figure 4. Figure extracted from Blajenkova, Kozhevnikov & Motes (2006), illustrating a sample question from the spatial imagery battery of the Object and Spatial Imagery Questionnaire (OSIQ). The following question requires participants to imagine the cube as seen from underneath and select the appropriate 2-dimensional figure (correct answer: 5).

The paper closes by raising an important question: could there be subtypes of congenital aphantasia? Watkins (2018), for instance, reports his aphantasia in conjunction with Severely Deficient Autobiographical Memory (SDAM; as in Watkins, 2018). Other cases of aphantasia, instead, maintained a distinction between visual imagery and memory-related visual imagery: whilst some relied exclusively on non-visual representations to complete memory tasks, a number of participants reported a preservation of their visual memory ‘even if visual imagery is absent’ (Zeman, Dewar and Della Sala, 2015).

Visual imagery has been described as a fundamental, irreplaceable component in vivid autobiographical recall (Greenberg & Knowlton, 2014). However, advancements in neurological research gave rise to a number of studies which developed the concepts of visual working memory and visual imagery individually. Tong (2013) argues ‘the baffling emergence of parallel literatures’ as a result of ‘divided universes that reflect one another, but scarcely interact’ (p. 489), providing supporting evidence of common internal representations in both imagery as well as working memory. Whilst further elucidation in the field is still required in order to establish whether or not such mental activities involve the same or different neural substrates, a line of research showed a close relation between the two (Keogh & Pearson, 2014; Albers et al., 2013), suggesting visual memory and visual imagery as mediated by similar, though not identical, cognitive processes (Slotnick, Thompson and Kosslyn, 2012). Some caution should nonetheless be applied; arguably, problematics may lie, a priori, in the challenges of creating experimental tasks which can effectively isolate visual memory from visual imagery, and vice versa. Such issues go beyond the scope of the following research; they do, however, invite further questions regarding the emergence of such visual memory/imagery distinctions among some of the aphantasics’ experiences. A possible explanation for this may be that, just as visual imagery varies in its spectrum of experiences across individuals, so aphantasia may present itself on different levels. On this matter, Watkins (2018) suggests an initial, heuristic diagram (Figure 5) to be further developed—a model primarily based on both a selection of current literature, and his personal experience of aphantasia and SDAM. The author, for instance, described his aphantasia as ‘a kind of invisible imagery’, where the sensation of having an image is present, yet the imagery is not seen. According to Keogh and Pearson (2018), this is not due to a lack of metacognition or inability to introspect, but may be the result of a deficit in the frontal cortex’s feedback connections, which does not enable the activation of the sensory representations in the visual cortex (p. 58)—that is, the visual image.

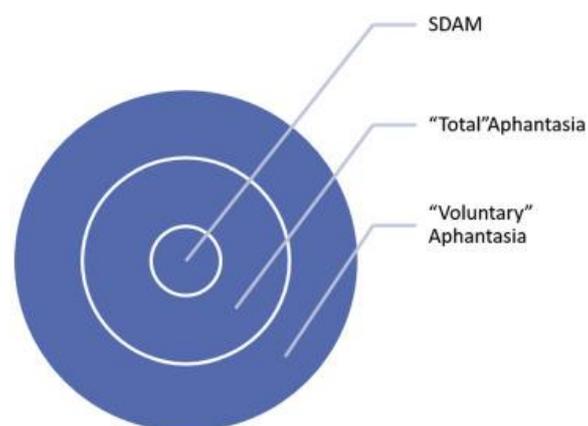


Figure 5. Graph extracted from Watkins (2018). A preliminary, heuristic diagram illustrating one of the possible relations between aphantasia and severely deficient autobiographical memory. The external band represents the lack of voluntary imagery (Zeman, Dewar and Della Sala, 2015).

There is certainly scope for further investigation of aphantasia, especially in relation to music listening. If music facilitates the experience of visual imagery (Quittner & Glueckauf, 1983; Osborne, 1981), could this also have an influence on some of the weaker forms of aphantasia? Some examples on the way music can encourage visual imagery also emerged informally in the present study (Chapter 3); whilst none of the participants declared themselves to be aphantasics, a small number spontaneously expressed at the start of the experimental session to generally experience very little or no visual imagery. Yet, by the end of the study, some of these were surprised to experience more imagery than they expected initially. In one of these cases, the participant simply did not consciously focus on this aspect of his music listening experience before: “...*this is the first time I thought about it. But obviously when I sit down and think about it, I do get visual imagery from music. I just never thought about it before*”.⁷ Nonetheless, further research is required to reveal whether music can affect, in any way, aphantasics' experiences in relation to imagery.

2.3.3 Mind Wandering

When I got to the allotment I had to put manure onto two of the small pots we have and then dig it in (...). Very shortly after starting the task I drifted off into my own little world. One minute I was looking at the end of a fork digging mud and the next I was dreaming. (Herbert, 2011:134)

Mind wandering, at times referred to as ‘daydreaming’, is a frequent phenomenon: it is estimated that between 25% and 50% of one's waking hours are spent engaged in thoughts unrelated to the ‘here and now’ (Smallwood & Schooler, 2015; Killingsworth & Gilbert, 2010). When the mind wanders, the attention drifts away from any external task and its current train of thought, to mental content which is generated by the individual rather than cued by the external environment (Smallwood & Schooler, 2015:489). For this reason, the process is also often described as self-generated thought (Smallwood, 2013) as a result of its independence from perception, as exemplified in Figure 6 (Smallwood and Schooler, 2015).

⁷ Extract from the face-to-face interview with a participant (less musically experienced group) from Study 1's sample (Chapters 3 and 4). Interviews extracts are cited in “*double quotation marks and italics*”.

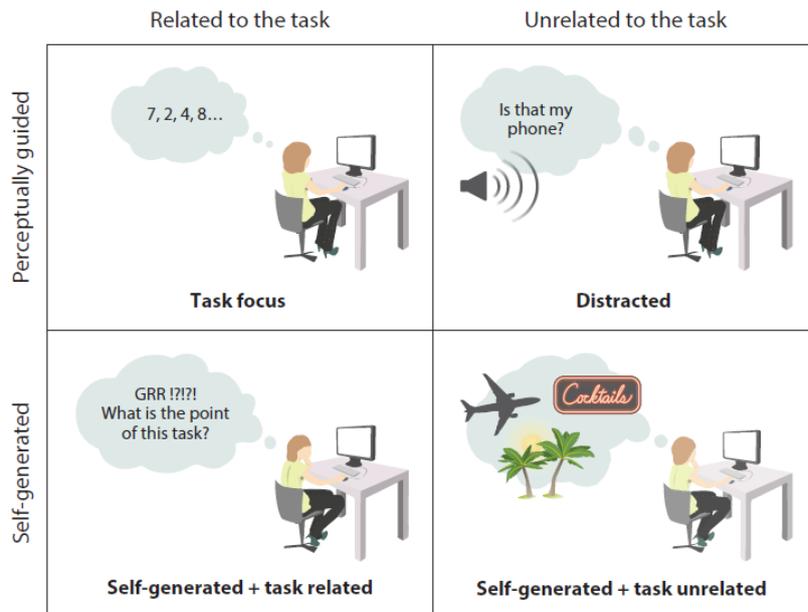


Figure 6. Extracted from Smallwood and Schooler (2015). Examples of related and unrelated tasks from self-generated thought and external distractions.

It should be stressed that, whilst visual imagery can be an important component of mind wandering, visual imagery—in particular during music listening—however, is not necessarily always a result of mind wandering. As the following thesis attempts to demonstrate, visual imagery can closely relate to the music listening experience: mental images may be formed from the associations made with particular sounds (such as birdsong), for instance; particular emotions which emerge during listening may lead to strong images in the mind; or again, the way the music's unfolding takes us by surprise can bring a twist to the imaginative narrative being created in the mind's eye (see Chapters 4 and 5 for the empirical studies' qualitative themes⁸). These simple examples suggest how musical engagement and visual imagery experiences can be closely related; whilst, contrastingly, as specified by Smallwood and Schooler (2015): 'participating in activities that encourage engagement in the task is one of the most effective ways to avoid mind wandering' (p. 509). It goes without saying that this does not at all exclude the possibility of experiencing mind wandering episodes whilst listening to a piece of music, and for visual imagery to derive from it. However, arguably, it suggests the possibility of a distinctive imagery process when the mind is involved in an engaged listening—musically focused and dependent, as opposed to the stimulus-independent (Antrobus, Singer & Greenberg, 1966) and task-unrelated (Giambra, 1989) features which characterise the wandering mind.

⁸ To differentiate 'qualitative themes' from 'musical themes' throughout the discussion, the latter will be referred to as theme^m.

2.4 Summary

This chapter reviewed literature exploring engagement and visual imagery in music-related research contexts. Listeners' engagement with the music is associated with enjoyment (Thompson, 2007), and plays a mediating role in perceived affective responses (Olsen, Dean and Stevens (2014). Levels of engagement in the course of a music listening vary and fluctuate. *Strong Experiences with Music* (SEMs; Gabrielsson, 2011) emerge from the high end of the scale, sometimes described as peak experiences. In a study by Lamont (2011), most strong experiences emerge as positive and involve flow-type states. This chapter also pointed out the possible techniques and benefits of employing continuous self-report measures, as a result of engagement's fluctuating nature—a method also adopted in this thesis' empirical studies.

Visual imagery in music listening is explored extensively in the music therapy domain. A prominent psychotherapeutic practice is Helen Bonny's *Guided Imagery and Music* (GIM), where clients share their images of an imaginary traveller whilst listening to a carefully programmed set of musical works. These works generally focus on Western music, with each musical set designed to serve specific therapeutic uses (Goldberg, 1995). Research from the music therapy domain provide various insights regarding visual imagery experiences. For instance, music seems to enhance visual imagery's vividness, when compared to a 'silence' condition (Band, 1996); and facilitates the experience of visual imagery (Quittner and Glueckauf, 1983). Beside the music therapy domain, recent studies support a prevalence of visual imagery experiences in music listening (Küssner & Eerola, 2017). A study by Küssner and Eerola (2017) reports three factors that emerged from participants' imagery descriptions: realistic, abstract and absorbing imagery. Music-induced visual imagery is also frequently associated with emotions (Juslin & Västfjäll, 2008; Balteş & Miu, 2014; Vuoskoski & Eerola, 2015). The programmatic information of a musical work may also influence music listeners' visual imagery experiences; for instance, narrative-oriented programmes seem to promote more visual imagery than an analytical programme (Zalanowski, 1986).

Visual imagery may be experienced in a variety of forms and contexts. Other experiences relating to visual imagery have been pointed out in this chapter, such as synaesthesia—a condition in which the stimulation of one sense involuntarily gives rise to an additional sensation (Specht, 2012)—and mind wandering—characterised by thoughts and attention drifting away from a performed task (Smallwood & Schooler, 2015). Finally, not everyone is able to experience visual imagery; Zeman, Dewar and Della Sala (2015) propose the term *congenital aphantasia* to describe cases of 'blind imagination'.

Chapter 3. Empirical Study 1: Quantitative Analysis

Potential areas of common ground between engagement and visual imagery have been identified and discussed over the previous two chapters. Whilst the engagement–visual imagery link is at times implicitly assumed in literature, there is still a paucity of empirical insights with regard to their relationship. Chapter 3 seeks to address this research gap, introducing the first exploratory study of this thesis. The study adopted a mixed-methods approach, comprising both quantitative and qualitative elements: self-reported continuous data provided details of where in the music and at what levels participants' responses took place, whilst free (written) annotations and face-to-face interviews enabled a qualitative insight into the content of these responses. It should be emphasized that visual imagery is a complex phenomenon. The methodological choice of a mixed methods approach enables an exploration of visual imagery from multiple angles, whilst allowing different kinds of data to complement and yield a more comprehensive account of participants' imagery experiences. One may argue the incompatibility between the philosophical premises of a positivist quantitative approach—a paradigm of experimental nature, seeking consensus between participants through hypothesis-testing (Williamson, Burstein & McKemmish, 2002:27–28); and a social constructivist qualitative approach—which rejects an objective truth and focuses, instead, on individualised knowledge and experience (Burr, 2003). However, studies highlight the strengths in appreciating the two approaches' complementarities, since their dichotomy can create a 'fundamental lacuna in comprehensive investigation and understanding of the complexities' (Balarabe Kura, 2012:15) of the phenomenon. Instead, the goal of mixed methods research is to draw from the strengths of quantitative and qualitative approaches and reduce some of their individual weaknesses (Johnson & Onwuegbuzie, 2004). Mixing design components could therefore offer 'the best chance of answering specific research questions'—an approach in line with pragmatist views (Ibid.:15). Therefore, in relation to visual imagery, a mixed methods approach highlights different, useful aspects of the phenomenon, whilst enabling stronger evidence through the convergence of findings (Ibid.:21). The present chapter introduces the quantitative findings of the study, whereas the qualitative investigations will be laid out in Chapter 4.

3.1 Aims

The broader scope of this study intends to provide an exploratory insight into music listeners' diverse experiences of visual imagery and engagement. More specifically, the study sets out to

investigate such experiences in response to integral, Western solo piano works and to address the following aims:

- Aim 1: To investigate whether links are present between engagement and visual imagery continuous responses during music listening.

Hypothesis 1: Following from the previous chapters, it was hypothesised that the ratings capturing the occurrence of visual imagery would be positively associated with the ratings of engagement with the music. Whilst studies explicitly exploring their relationship is scant, a study by Tavernaro (2016) supported a positive correlation between the two. Moreover, the underlying emotional response in music listening may be a potential common ground: visual imagery is frequently associated with emotions (Juslin & Västfjäll, 2008; Balteş & Miu, 2014; Vuoskoski & Eerola, 2015); and musical engagement may also play a mediating role in affective responses (Olsen, Dean & Stevens, 2014). Other literature implicitly points towards a potential visual imagery–engagement link (see Section 1.2).

- Aim 2: To explore a selection of participants' individual differences in relation to engagement and visual imagery responses.

Hypothesis 2: Recent studies point towards significant correlations between visual imagery experience and aspects of musical skills (Küssner & Eerola, 2017; Tavernaro, 2016). In addition, various studies suggest an active, frequent use of visual imagery by music performers for a variety of purposes, such as memorisation (Holmes, 2005), performance anxiety and relaxation techniques (Bowes, 2009), motivational support (Clark, Williamon & Aksentijevic, 2012), or metaphorical associations to enhance sound production (Trusheim, 1991, 1987). It was therefore hypothesised that higher levels of visual imagery would occur among more musically experienced participants than less musically experienced individuals, regardless of its content—whether this involved narratives or visualisations of the score.

- Aim 3: To explore the content and nature of visual imagery and engagement responses through the collection of qualitative data (obtained through written annotations and face-to-face interviews).

This aim was exploratory; no hypothesis was made with regard to the content of participants' imagery responses.

3.2 Method

3.2.1 Design

As outlined at the beginning of this chapter, the present exploratory study employs a mixed methods approach. The quantitative component forms the first part of this study. Aim 1 was investigated through the collection of participants' continuous visual imagery and engagement responses, analysed through *time series analysis* (see Section 3.2.5). Aim 2 investigated a selection of participants' individual differences, which involved: musical experience (scores obtained using the *Goldsmiths Musical Sophistication Index* v1.0; Müllensiefen et al., 2014); one's propensity to experience absorption in music listening (*Absorption in Music Scale*; Sandstrom & Russo, 2013); and (self-rated) one's tendency to use visual imagery in everyday life (*Spontaneous Use of Imagery Scale*; Reisberg, Pearson & Kosslyn, 2003).⁹ In addition, single scores for the pieces' likeability and piece/genre familiarity were gathered using a 7-point Likert-type scale. This data was analysed through the use of two statistical tests: Pearson's/Spearman's correlations and ANOVAs—the latter being conducted separately for engagement and visual imagery ratings, with a between-subjects factor of more/less musically experienced, and within-groups factor of piece (Debussy, Leginska, Rachmaninov and Prokofiev). Aim 3, the qualitative component that forms the second part of the study, was explored through a thematic analysis (TA; Braun & Clarke, 2006; Nowell et al., 2017) of participants' visual imagery annotations (see Section 4.1).

3.2.2 Participants

Thirty-four participants¹⁰ (16 female, 18 male) undertook the experiment voluntarily; all participants received an entry into a prize draw, wherein one of two £15 Amazon vouchers could be won. All participants agreed to take part in the study through written informed consent. The study was approved by the School of Drama, Music and Screen Ethics Committee of the University of Hull on March 4, 2016. The study was advertised through the distribution of posters and email call-outs to University of Hull staff and students, as well as non-university members. Ages ranged from 21–72

⁹ See Appendix 3 for full questionnaires.

¹⁰ A total of 35 participants joined the study; however, only data from 34 listeners were usable. Data from participants who expressed being 'too engaged with the music to remember to move the slider' were omitted from the piece/task in question:

- Participant n.21 omitted from Leginska's *Cradle Song* (flawed task: engagement)
- Participant n.21 omitted from Debussy's *Valse Romantique* (flawed task: engagement)
- Participant n.7, 8 and 31 omitted from Prokofiev's *Suggestion Diabolique* (flawed task for participants 7 and 31: imagery; participant 8: engagement). Participants 7 and 8's ratings for this piece were omitted due to an issue with the running of the software.

years, with a mean age of 35.56 (SD = 13.44). Occupations included currently being in higher education (70.59%), full-time or part-time employment (17.65%), self-employed (5.88%) and retired (5.88%). Twenty-three participants had completed a postgraduate degree, two had completed an undergraduate degree or A-Level qualifications and nine cases did not specify any attained qualification. Nationalities were also varied across the group, with 55.88% British and the remaining 44.12% consisting of participants from 14 different countries. No participant reported experiencing synaesthesia in relation to music listening. In order to investigate the possible effects of music training and expertise, ‘more musically experienced’ and ‘less musically experienced’ groups were formed by ranking the Gold-MSI *Musical Training* scores (Müllensiefen et al., 2014)¹¹: the top half, comprising the highest scores from 50% of participants, were classified as more musically experienced, while the remaining participants were classified as less musically experienced—groups which also particularly reflected the current musical status or self-consideration of participants’ musical expertise. Further demographic details for each group are displayed in Table 4.

Table 4. Participants’ demographic details for the more and less musically experienced groups.

	More musically experienced	Less musically experienced
Age	M = 35.29, SD = 15.95	M = 35.82, SD = 10.84
Sex	6 Females 11 Males	10 Females 7 Males
Gold-MSI <i>Musical Training</i> Scores	Mdn = 39 (Range 32–45)	Mdn = 17 (Range 7–31)

3.2.3 Materials

Four complete pieces of Western solo piano music were performed by the researcher on a Yamaha C3 and audio recorded in a Sonic State Logic (SSL) Duality Studio for the purposes of the experiment. Each selection was a composition from the late 19th or early 20th centuries and lasted approximately three minutes. The musical works were selected with the aim of offering a variety of texture, harmonic language, dynamic levels and contrasting musical characters between them, yet maintaining a relatively short duration. Each track began with three silent seconds before the start of the music; this was to allow time for participants to focus on the new track and for the researcher to move away from the equipment area, due to pieces being manually set up before each task. Works from four different composers were selected, presented in Table 5 (to facilitate discussions, future in-text citations of the pieces will be referred to by their composers’ surnames—such as ‘Debussy’ for *Valse Romantique*).

¹¹ No musical genre restrictions applied, although the large majority of the more musically experienced group was formed by classical musicians.

Table 5. Details of music pieces used as auditory stimuli.

Composer	Piece	Date of Composition	Track Length
C. Debussy	<i>Valse Romantique</i>	1890	3'22"
E. Leginska	<i>Cradle Song</i>	1922	1'40"
S. Prokofiev	<i>Suggestion Diabolique</i> , Op. 4 No. 4	1908	3'24"
S. Rachmaninov	<i>Étude-Tableaux</i> Op. 33 No. 4 (D Minor)	1911	3'31"

Continuous engagement and visual imagery ratings from participants were recorded through the use of a continuous affect rating and media annotation software: CARMA beta v.13.01 (Girard, 2016). A modified version of the original program (Girard, 2014) was used, which integrates the use of a 100mm MIDI slider (I-CubeX Push V1.1) as an input device.¹² This was installed on an Aspire E15 E5-571-39S2 laptop, from which tracks were played at 80 volume units¹³. Participants used KRK Systems KNS-6400 headphones to listen to the audio tracks. A view of the listening tasks set-up may be seen in Figure 7. Semi-structured face-to-face interviews at the final stage of the experimental procedure were audio recorded using a TASCAM DR-05 V2 Portable Digital Recorder; throughout this session, extracts from the audio stimuli were played back as listening cues through a set of GENELEC 1029 speakers.

The experiment was carried out in an office at the University of Hull campus. To reduce the possibility of visual distractions by participants in the course of the listening tasks, the experimental room was plain and the computer screen back-faced participants' frontal view.¹⁴



Figure 7. Experimental set-up for the listening tasks.

¹² The CARMA software originally required the use of a joystick or mouse to record continuous responses; the former did not allow a good sense of the scale's extremes when rating continuously, whilst the latter required the use of a computer screen, which seemed likely to be a source of visual distraction, particularly during the visual imagery task. The use of a slider interface overcame these issues, also enabling participants to keep their eyes closed whilst the task was being performed.

¹³ Only three participants required lower volume levels due to hearing aids or ear sensitivity.

¹⁴ Participants did not see the computer screen at any time during the listening tasks.

3.2.4 Procedure

Pre-experiment Questionnaires. Approximately 48 hours before the agreed meeting, participants were sent an electronic questionnaire via email. This comprised the *Goldsmiths Musical Sophistication Index v1.0*¹⁵ (Gold-MSI; Müllensiefen et al., 2014) and the *Absorption in Music Scale* (AIMS; Sandstrom & Russo, 2013)—a test measuring individuals' ability or willingness to be drawn by the music into an emotional experience.

Listening Tasks. The experiment took place in an office at a university campus; possible elements of visual distraction were removed from participants' view. In their first task, participants were asked to listen to the four piano pieces and rate either their engagement with the music or their experienced visual imagery, as specified by the researcher. The same pieces were then played again in the same order, this time undertaking the alternative listening task not completed previously (engagement or visual imagery). The order of the tracks was randomised before each experimental session through an online list randomiser [random.org].

In the engagement task, participants were asked to continuously rate their engagement with the music using a slider. The following instructions and definition of engagement were given: *“feeling compelled, drawn in, connected to what is happening in the music, interested in what will happen next (Schubert, Vincs & Stevens, 2013); it does not matter whether this is in a positive or a negative way: please rate how immersed you are in what you are listening”*. An increase in engagement was indicated by moving the slider vertically upwards (away from participants' body), whilst decreases in engagement were expressed through a downward movement of the slider. The lowest point on the slider implied minimal engagement with the music.

The second task involved indicating whether at any moment, whilst listening to the music, any visual imagery emerged from the music being played. Participants were given new instructions: *“visual imagery is sometimes described as seeing with the mind's eye. Please indicate whether any images come into your mind from listening to that piece of music. (...) Please be very honest with your responses. There is no right or wrong answer: we are interested in people who imagine as much as in people who do not imagine at all”*. Once again, the slider was used to track continuous responses: a rise of the slider indicated the presence and possible strength or vividness of the visual imagery, whilst positioning the slider fully down indicated no imagery being experienced.

¹⁵ Batteries of the Gold-MSI comprise: active musical engagement; self-reported perceptual abilities; musical training; self-reported singing abilities; sophisticated emotional engagement with music.

The order of presenting each task was counterbalanced across participants. Prior to the main data collection, a short clip was played as a short task trial, in order to allow participants to familiarise themselves with the use of the slider (the opening bars of Rachmaninov's *Étude-Tableaux* Op. 39 N.2 in A Minor [track length 21''] were used for this).

After each piece, participants completed brief questions on the likeability and piece/genre familiarity of the piece heard, using a 7-point Likert-type scale. Following the imagery tasks, participants were also asked to provide—if applicable—any annotation to remind them of the imagery experienced, as well as suggesting a possible title for the piece. The order of these questions was arranged in relation to the order of the listening tasks (engagement/visual imagery)¹⁶.

Post-Listening Questionnaire. Following the listening tasks, participants completed the *Spontaneous Use of Imagery Scale* (Reisberg, Pearson & Kosslyn, 2003), a measure recording individuals' self-rated tendency to use visual imagery in everyday life.

Interviews.¹⁷ For those wishing to proceed further, a semi-structured face-to-face interview was then immediately conducted. Overall, 34 participants were interviewed, but data for one interviewee were lost due to a technical problem, leaving a total of 33 interview transcripts for analysis;¹⁸ imagery experiences were discussed with the aid of participants' annotations and the use of listening cues, alongside a display of their continuous responses through CARMA's review and playback function (example in Figure 8).

The overall experimental procedure lasted approximately one hour. A visual overview of the procedure is presented in Figure 9.

¹⁶ An example of the question sheets used may be found in Appendix 4.

¹⁷ See Appendix 5 for further details on the semi-structured interviews' questions.

¹⁸ See Appendix 6 for a sample interview transcript.

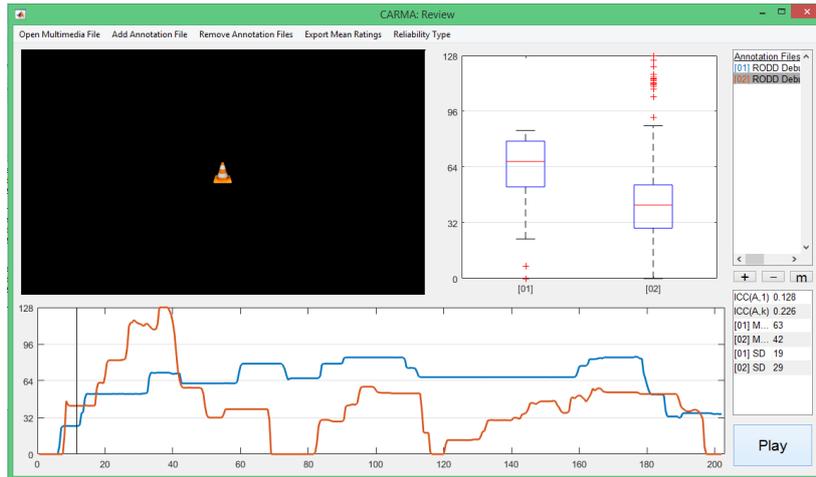


Figure 8. CARMA's review function, displaying one participant's continuous responses whilst listening to Debussy's *Valse Romantique*. The blue line indicates the participant's engagement ratings, whilst the red line illustrates the ratings for visual imagery. The review function allows the music track to be played in line with the observed continuous ratings.

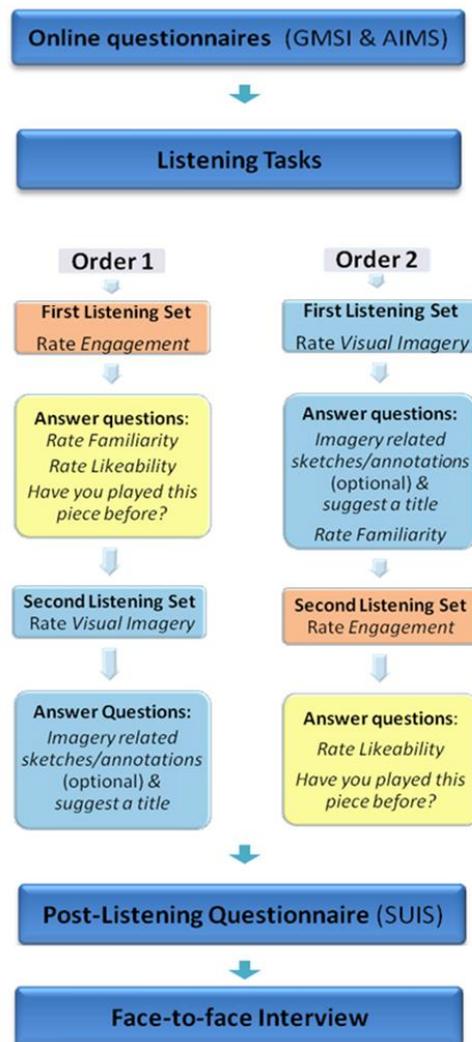


Figure 9. Experimental procedure and order of tasks¹⁹.

¹⁹ Orders 1 and 2 were alternated between participants in order to counterbalance the alignment of the listening tasks.

3.2.5 Data Analysis

In order to test whether continuous ratings of engagement corresponded with the reported occurrences of visual imagery, a time series analysis was performed with the use of *R* programming software (R Core Team, 2013). The time series analysis was an important process in revealing whether such associations are present, since conventional correlation analyses rely on the assumption of independent data points (Bailes & Dean, 2012:363). This assumption, however, is not valid for the time series data, since they do not comprise independent values: each point is inevitably related to the preceding and related to the next. An insightful paper by Dean and Dunsmuir (2016) warns against the dangers of the ‘unfunded reliance’ placed on cross-correlations in analysing time series, which frequently misleads into spurious relationships. For a detailed insight into the analytical procedures involved, Dean and Dunsmuir (2016) and Dean and Bailes (2010) provide comprehensive accounts.

A brief outline of the steps involved is provided below, alongside relevant samples of R code [in Courier New font] extracted and adapted from Dean and Dunsmuir (2016).

Times Series Analysis Code Samples and Procedure

1. Outliers Removed from Each Series. A grand mean series is produced (for each observed measure) by averaging across participants' series at each sampled time point. Values which exceed + or - 2.5 standard deviations from the overall series mean are replaced by the nearest value from that range (hence, the appropriate mean + or - 2.5 SDs).

2. Stationarity. The series is differenced (a new series is created of the difference values between each data point in the series and its predecessor) using the R code below at lag = 1, until stationarity is achieved—that is, the mean and variance are constant. Stationarity is tested using the Kwiatkowski-Phillips-Schmidt-Shin (KPSS); a stationarized series' value at a given time should be a predictor of change with a negative coefficient, ‘since larger than mean values tend to be followed by smaller ones and vice versa’ for the next value to be closer to the mean (Dean & Bailes, 2010:156).

Code example:

```
kpss.test(rac_mus_imag)           #KPSS stationarity test. If significant, the
                                  #series is not stationary.

dlimagery <- diff(rac_mus_imag, lag=1) #First-differencing the original
                                       #series.
```

```
d2imagery <- diff(d1imagery, lag=1)      #Second-differencing the series
                                         #(when required to achieve
                                         #stationarity of the series, as
                                         #indicated by the KPSS test.
```

3. Pre-whitening. Although the previous step contributes towards clearing the series of autocorrelation, differencing only is not enough. Pre-whitening de-correlates a series by removing its purely autoregressive statistical time series model. The difference between the actual series and the model created leaves us with residuals as white noise (tested with a measure by Bartlett, 1966). The autoregressive model obtained (its autoregressive lag structure and coefficients) is subsequently used to also generate residuals from the second series; only at this stage may cross-correlations between the two series' residuals be meaningfully assessed.²⁰

```
n<-length(d2imagery) #Specifying the number of events in the series.

X<-d2imagery
Y<-d2engagement
lag.max<-10          #Maximum acf lags to be used for the empirical analysis,
                     #here selected as 10 lags (5 seconds).

#Code to proceed with pre-whitening:

acfX<-acf(X,plot=FALSE,lag.max=lag.max)$acf
acfY<-acf(Y,plot=FALSE,lag.max=lag.max)$acf
sdCCF1<-(1/n*(1+2*sum(acfX*acfY)))^0.5 #A vectorised multiplication of
                                         #the acfs, and the summation of
                                         #the results.

criterion <- 1.96*sdCCF1 #Estimated 95% significance value for the CCFs.

prewhiten(d2imagery, d2engagement, ylim = c(-0.3,0.3), main = "Cross-
correlation after pre-whitening")      #Producing CCF graph after
                                         #pre-whitening
```

4. Granger Causality. If significant cross-correlations emerge from the CCF graphs created, the Granger causality test may be used to assess whether a particular series statistically predicts the other, hence testing the possibility of a predictive causal relationship (Granger, 1969). In other words, the test compares the model in which a variable y is explained by an order of lags of variables

²⁰ For further details, see 'Pre-whitening' in the Glossary section of Bailes and Dean (2012).

y and x, against the model in which variable y is only explained by the lags of y. If variable x is Granger-causal, its preceding values help to predict y's current value (Dean & Dunsmuir, 2016:788). Significant lags identified from the cross-correlation function are used to define the number of lags (1 lag = 0.5 seconds), or 'orders', entered into the test. Whilst this test points out likely Granger-causal relationships, it does not however specify the quantitative impact of the variables involved.

```
grangertest(d2imagery, d2engagement, order = 2) #At 2 lags,  
                                                #Imagery -> Engagement  
grangertest(d2engagement, d2imagery, order = 2) #At 2 lags,  
                                                #Engagement -> Imagery
```

3.3 Results

The ensuing sections report the study's results in three main parts. First, an overview of participants' overall continuous ratings of visual imagery and engagement is provided, as well as a brief discussion of these responses in relation to the musical works by Debussy, Leginska, Prokofiev and Rachmaninov. Second, tests of relationship between engagement and visual imagery series are presented with the two series' cross correlation functions and Granger causality tests detailed. Third, participants' individual difference tests (correlations and ANOVAs) are reported.

3.3.1 Examples of Response Context

Figures 10, 13, 15 and 17 display the mean responses series of the entire group's engagement and visual imagery ratings (mean values are calculated at every 0.5 second of each piece across the sample group). These grand series provide a sense of salient moments in the music over time, with respect to the mean engagement and imagery responses. The following discussion draws upon particular areas of interest in the averaged responses, such as peaks in overall ratings, in relation to the musical work. Timings of responses and bar numbers are provided for informative purposes; these are, however, only an approximate indication of the sample's averaged responses. Nonetheless, the discussion aims to provide the musical context of particular peaks—or troughs—in engagement or imagery ratings across the sample group.

An initial glance at the series suggests that, on most occasions, participants' highest engagement or imagery mean ratings were generally reached around the central section of the pieces. This is particularly the case for Debussy, Leginska and Rachmaninov's imagery ratings—orange line in Figures 10(a), 13(a) and 17(a)—where peaks in the central area of the series are clearly visible. While this also mostly applies to the three pieces' engagement series, these display greater variation in

terms of their peak in ratings, as discussed below. With regard to Prokofiev, the highest ratings in both engagement and visual imagery occurred at a slightly later point in the music—just after two thirds of the piece, in line with a building up of the musical material. Overall, the graphs displaying separate mean series for the more and less musically experienced groups (panels (b) and (c) of Figures 10, 13 and 17), indicated generally higher ratings for the former, despite occasional overlaps between the two groups' averaged imagery series—as in Rachmaninov, Figure 17(c).

3.3.1.1 Debussy, *Valse Romantique*

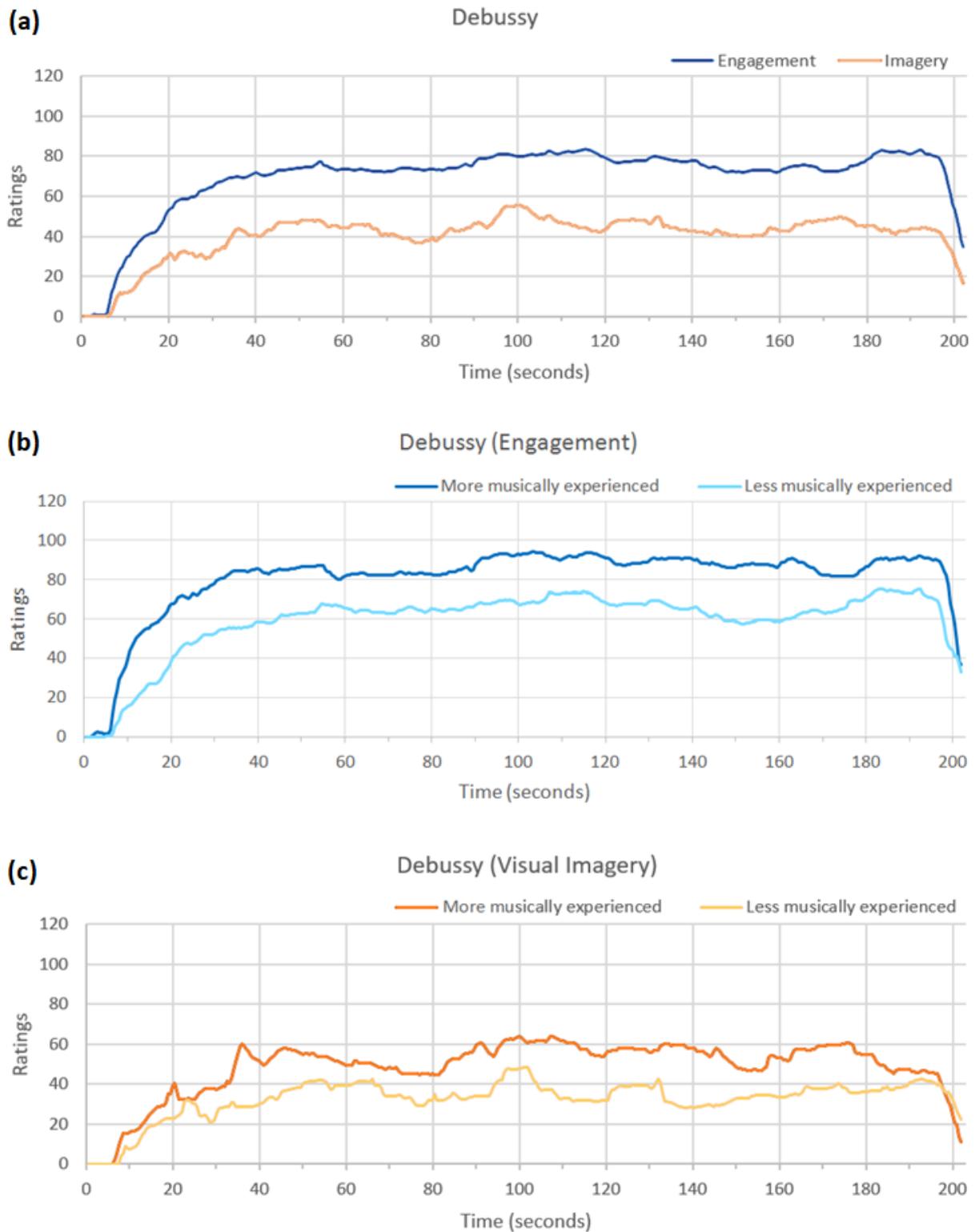


Figure 10. Responses to Debussy's *Valse Romantique*.

Panel (a) displays participants' overall mean **engagement** and **visual imagery** ratings (sampled every 0.5s) in response to Debussy's *Valse Romantique*. The two lower panels compare responses from the more musically experienced and the less musically experienced groups for engagement (b) and visual imagery (c).

The highest point of Debussy's grand mean ratings for visual imagery (see Figure 10(a), orange line, just before 100 seconds) coincides with the music's bars 74 to 75, displayed in Figure 11. In terms of the piece's structure, the following passage emerges from an unexpected twist in the musical material: bar 59 brings a return of the opening theme^m, which despite a slightly varied left-hand accompaniment and the melodic line shifted up an octave is nonetheless presented in its original key (F minor). Conversely, the arpeggiated figures that follow (originally in C major) make their appearance in D-flat major (bar 66), leading into a new elaboration of the musical material (bar 74). Although average engagement ratings are also relatively high at this point, the highest level of mean engagement is reached slightly later (see Figure 10(a), blue line, around 115 seconds)—although, noticeably, such increase is marginal. This takes place toward the end of the work's central climax (this increase peaks around bars 85–86, Figure 12). Similarly, a further rise in engagement ratings emerges toward the end of the piece, the work's final *ff* climax. This suggests that, within the context of the Debussy, there was a tendency for slight increases in engagement ratings toward musical climaxes.

Figure 11. Debussy's *Valse Romantique*, bars 72–79; the top horizontal line provides an approximation of the highest peak in averaged (mean) visual imagery ratings from the group.

Figure 12. Debussy, bars 83–88; the horizontal line indicates an approximation of the highest peak in averaged (mean) engagement ratings.

3.3.1.2 Leginska, Cradle Song

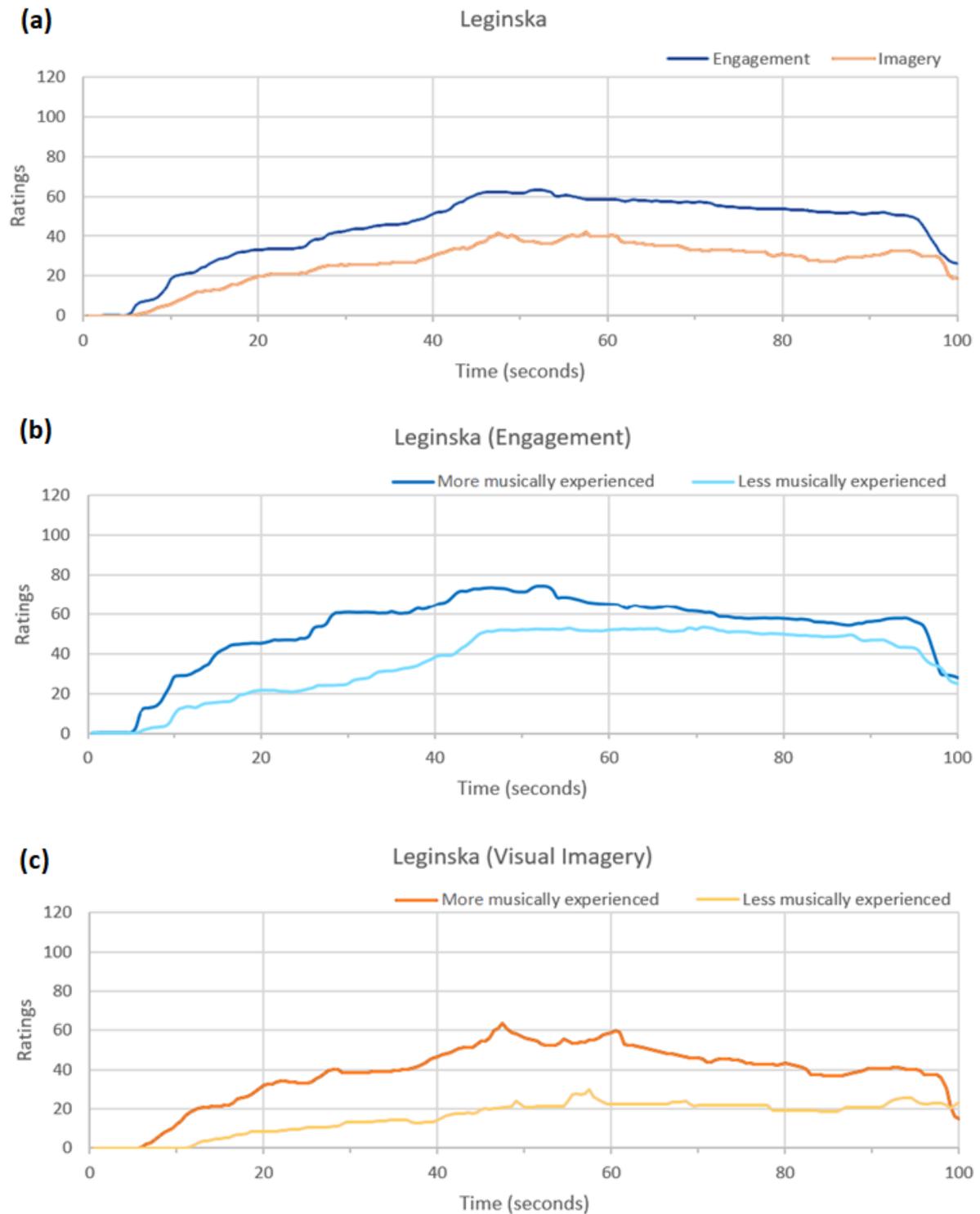


Figure 13. Responses to Leginska's *Cradle Song*.

Panel (a) displays participants' overall mean **engagement** and **visual imagery** ratings (sampled every 0.5s) in response to Leginska's *Cradle Song*. The two lower panels compare responses from the more musically experienced and the less musically experienced groups for engagement (b) and visual imagery (c).

Leginska's *Cradle Song* differs from the other three pieces, both in terms of dynamic levels—overall maintained low throughout the piece and never exceeding a brief *mf*—and in the use of rather unusual harmonies, characterised by frequent dissonant notes. In a brief, central section of the piece, however, harmonies simplify into a ‘tonally familiar’ A minor for a lyrical lullaby-like melody (starting in bar 17, *più mosso*). It is within this section that both averaged engagement and visual imagery series reached their highest ratings levels (Figure 14). Interestingly, the grand mean imagery series (Figure 13(a), orange line) captures a small drop in ratings between two central peaks; this is especially notable in the more musically experienced group's series (Figure 13(c), darker line). It may be possible that, particularly for the more musically experienced individuals, the repetitive patterns which followed the lullaby theme^m's initial exposition did not encourage as many visual imagery experiences. Interestingly, however, these soon rise once again, as the music proceeds *ritenuto* towards the end of the lullaby's section (see latter bars from Figure 14).



Figure 14. Leginska, bars 19–28; the horizontal blue line indicates an approximation of the highest peak in mean engagement ratings; the orange line indicates the two highest peaks in visual imagery ratings.

3.3.1.3 Prokofiev, *Suggestion Diabolique*

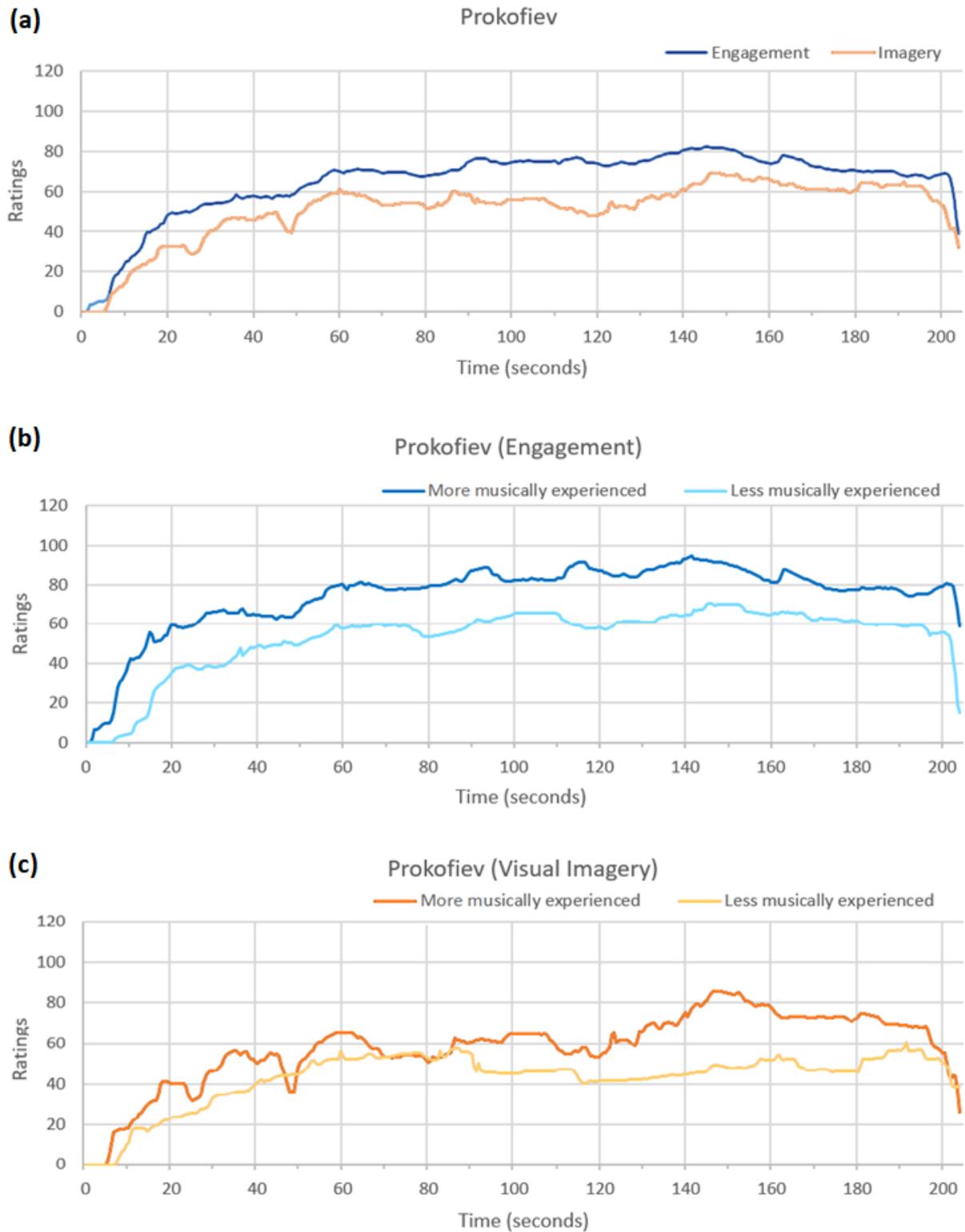


Figure 15. Responses to Prokofiev's *Suggestion Diabolique*.

Panel (a) displays participants' overall mean **engagement** and **visual imagery** ratings (sampled every 0.5s) in response to Prokofiev's *Suggestion Diabolique*. The two lower panels compare responses from the more musically experienced and the less musically experienced groups for engagement (b) and visual imagery (c).

For the Prokofiev, as in the Leginska, participants' mean ratings of engagement and visual imagery peak around the same passage (Figure 15(a)): these take place around bars 90–91 (Figure 16). As observed from the series, the engagement ratings presented an earlier drop, whilst the imagery ratings were maintained higher for slightly longer. A closer look at the ratings from each of the two musical experience groups, however, suggests that the peak in imagery at this point predominantly occurs in the more musically experienced series (Figure 15(c), darker line, just before 150 seconds). Once again, it appears that the intense build-up gained from the preceding bars led to higher response ratings from the sample, although this seemed more the case for more musically experienced participants with regard to imagery. These differences in responses could be explained by the more musically experienced group's level of familiarity with more musically complex works and different compositional styles—if compared, for instance, to pieces such as Debussy, generally considered more accessible to an unfamiliar ear. It may be possible that the boisterous qualities of this passage prompted more visual imagery among participants who were not disturbed or distracted by the qualities of the music. As the piece increasingly builds, the listener is presented with fast and abrupt changes: sudden *sforzando* chords, immediate dynamic drops, and quick alternations between repeated musical patterns (as in bar 85) and rising chromatic chords; only the persistent, almost obsessive, quaver rhythms prevail throughout.

Figure 16. Prokofiev's *Suggestion Diabolique*, bars 85–93; the top lines indicate an approximation of the highest peaks in mean engagement ratings (blue) and visual imagery (orange).

3.3.1.4 Rachmaninov, Etude-Tableaux Op. 33 No. 4

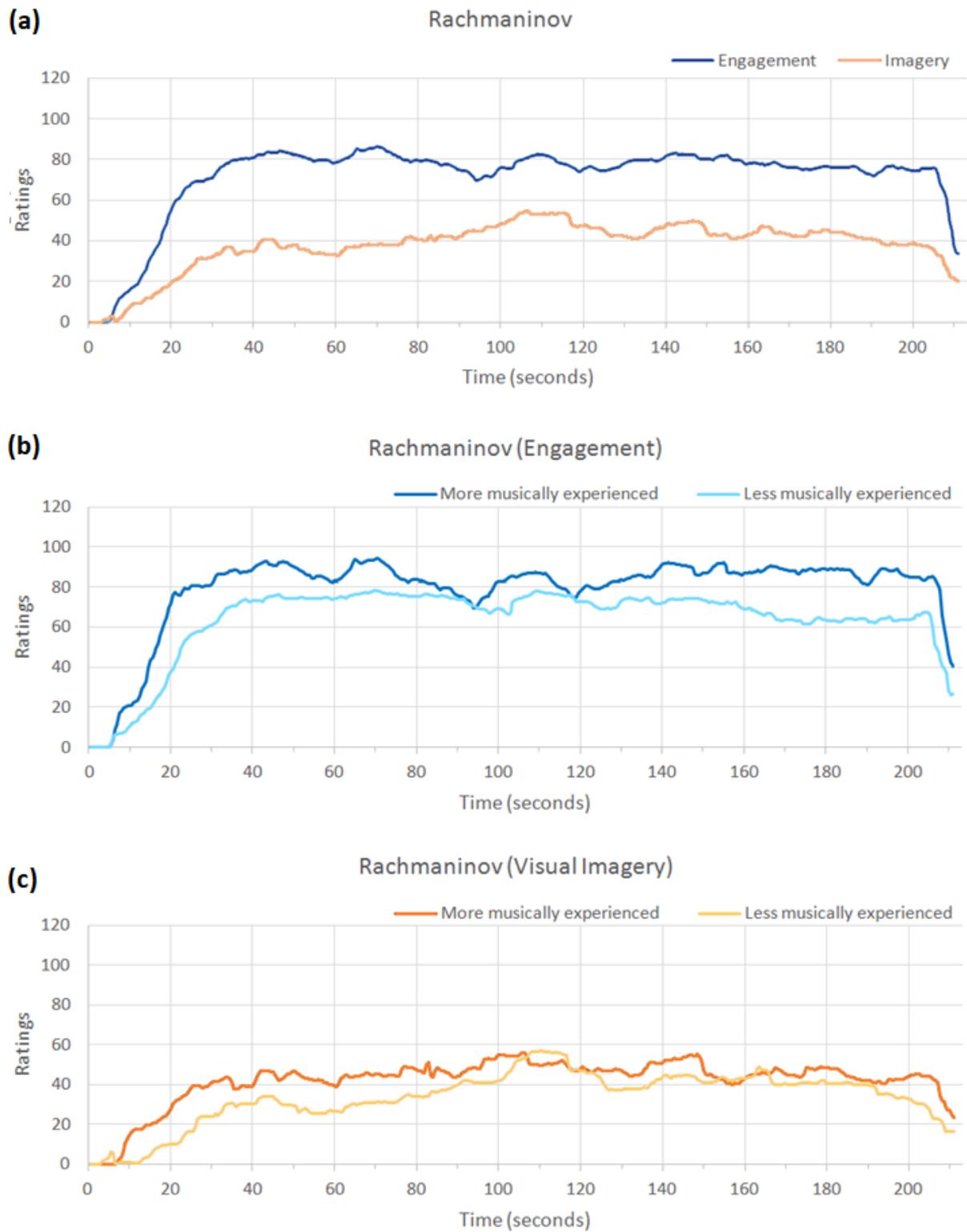


Figure 17. Responses to Rachmaninov's *Etude-Tableaux* Op. 33 No. 4.

Panel (a) displays participants' overall mean **engagement** and **visual imagery** ratings (sampled every 0.5s) in response to Rachmaninov's *Etude-Tableaux* Op. 33 No. 4. The two lower panels compare responses from the more musically experienced and the less musically experienced groups for engagement (b) and visual imagery (c).

The possible coincidence of peak imagery and engagement responses with certain aspects of the music in Debussy, seems to be reversed when looking at the sample's peak responses to Rachmaninov. This time, it is the highest peak in *imagery* ratings (at approximately 105–115 seconds in Figure 17) which takes place during the first, small climax of the piece (Figure 18). As may be observed in Figure 17, the engagement ratings also present a particular increase during this passage of the music; however, its highest peak is reached at an earlier stage: around bars 20–21, the return of the work's initial theme^m (Figure 19). Therefore, Rachmaninov's musical climax attracted overall higher imagery ratings and the return of the (by then) familiar, thematic^m material was rated particularly highly in engagement.

Figure 18. Rachmaninov's *Etude-Tableaux* Op. 33 No. 4, bars 32–38; the horizontal line indicates the highest peak in visual imagery ratings.

Figure 19. Rachmaninov, Op. 33 No. 4, bars 19–21; the top blue line indicates the highest peak in mean engagement ratings.

3.3.2 Tests of the Relationship between Engagement and Visual Imagery

Once the series were stationary (following differencing of the data) and after the completion of the pre-whitening phases of the time series analysis, the engagement and visual imagery series emerged as significantly related in all four pieces of music. This was the case for the more and less musically experienced groups, as well as the global mean across all participants—the latter may be observed in Figure 20; further cross-correlation function (CCF) graphs may be found in Appendix 7.

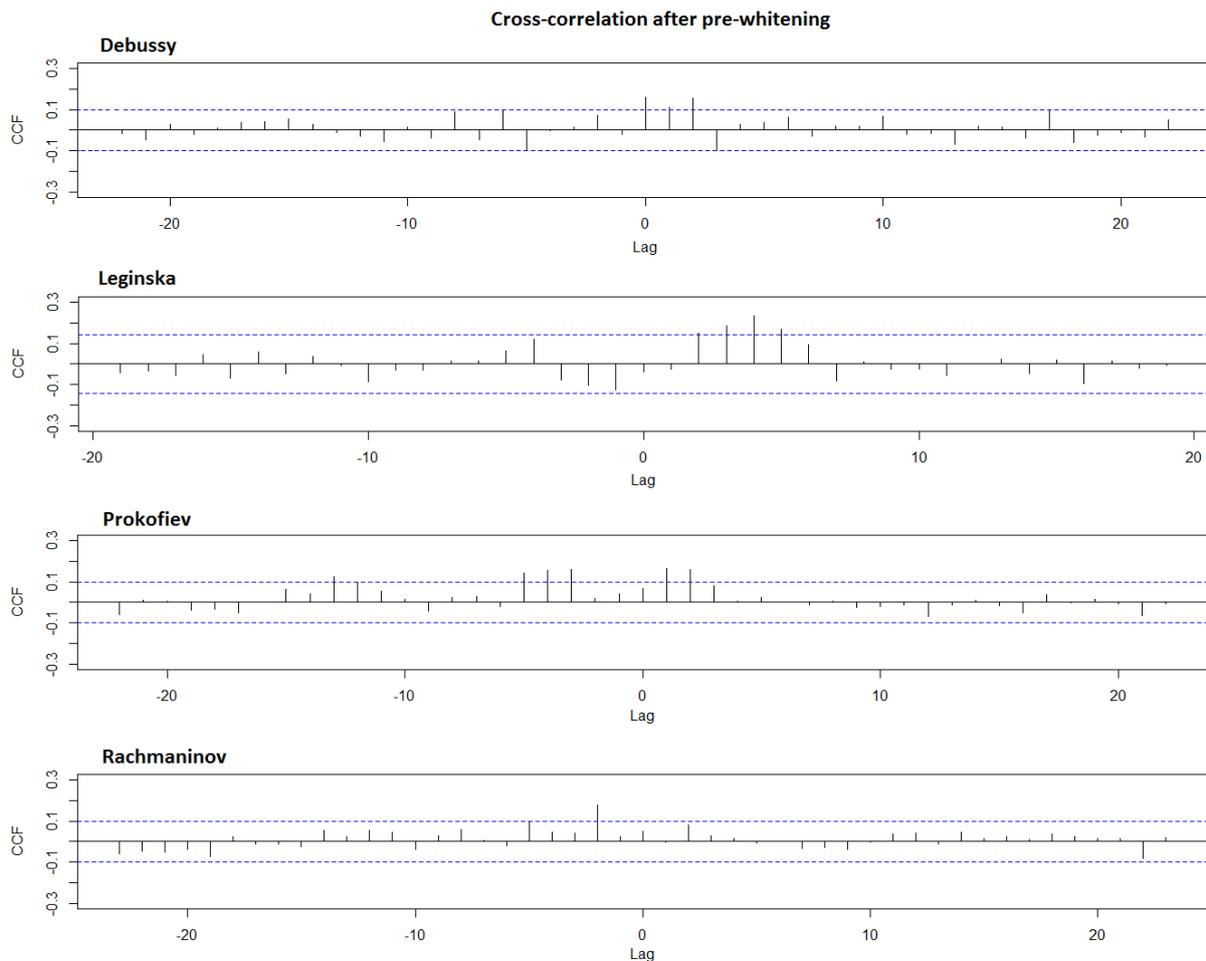


Figure 20. Cross-correlation function (CCF) graphs between pre-whitened engagement and visual imagery global mean series (all participants merged into a single group), per piece. Statistical significance is indicated by the vertical line/s exceeding the upper or lower dashed horizontal line.

3.3.2.1 Time Series: Granger Causality Test

The Granger causality test was then used to assess whether particular series statistically predicted the other (Granger, 1969); the results per group and piece are summarised in Table 6. For the overall group grand mean series, engagement statistically predicts visual imagery, with the exception of Rachmaninov. When series were divided by musical experience, visual imagery statistically predicted the engagement series on four occasions, three of which emerged in the less musically experienced

group series (for Debussy, Prokofiev and Rachmaninov). Engagement predicted visual imagery on three occasions: twice among the more musically experienced group series (Debussy and Prokofiev), and once in the less musically experienced group (Leginska). The Granger causality for Leginska's more musically experienced group was not statistically significant in either direction, despite the significant lags confirmed by the cross-correlation functions. It therefore appears that whilst a meaningful relationship between the imagery and engagement series has been established, when directions of influence are considered individually (imagery predicting engagement and vice versa), their predictive strength is insignificant. Hence, a bidirectional relation of the series may be more likely in this case, although engagement predicted imagery in Leginska's other groups and series.

Table 6. Outcome of the Granger causality tests per group and piece, specifying the level of differencing required to achieve stationarity of the series (first or second order), the significant lags at which Granger tests are performed and the direction of the Granger causality.

Piece	Group	Granger Causality				F
		Differencing	Lag	Direction		
Debussy	More Musically Experienced	Second-order	4	Engagement → Visual imagery ***	6.72	
	Less Musically Experienced	First-order	7	Visual Imagery → Engagement ***	4.97	
	Overall Group	Second-order	3	Engagement → Visual imagery ***	7.63	
Leginska	More Musically Experienced	Second-order	4	Engagement ↔ Visual Imagery Visual imagery → Engagement	0.45	
				Engagement → Visual imagery	0.64	
	Less Musically Experienced	First-order	5	Engagement → Visual imagery *	2.75	
	Overall Group	Second-order	5	Engagement → Visual imagery *	2.49	
Prokofiev	More Musically Experienced	Second-order	4	Engagement → Visual imagery *	3.14	
	Less Musically Experienced	Second-order	4	Visual Imagery → Engagement ***	4.90	
	Overall Group	Second-order	5	Engagement → Visual imagery *	2.69	
Rachmaninov	More Musically Experienced	Second-order	2	Visual Imagery → Engagement **	6.37	
	Less Musically Experienced	Second-order	4	Visual Imagery → Engagement *	2.98	
	Overall Group	Second-order	2	Visual Imagery → Engagement *	4.18	

Note. Arrows indicate the direction of statistical prediction at the reported lag. Lags at which an association was found are included, with each lag representing 0.5 s. * p < .05, ** p < .01, *** p < .001

3.3.3 Individual Differences

To explore (selected) individual differences, each participant's continuous data were averaged into a single mean value for each measurement (visual imagery and engagement) per piece. Data collected from both questionnaires and mean values of continuous ratings were tested for violation of normality; some data categories deviated significantly from normal. Two of the Gold-MSI's sub-sections, the *Musical Training* battery, $W(34) = .90, p = .004$ and the *General Sophistication* battery, $W(34) = .93, p = .036$, significantly deviated from normal distributions. This was also the case for Debussy's imagery mean scores, $W(34) = .92, p = .019$; Leginska's imagery scores, $W(34) = .79, p < .001$; and Rachmaninov's imagery scores, $W(34) = .92, p = .016$. Spearman's rho correlation test was therefore used.²¹

3.3.3.1 Visual Imagery and Engagement

Participants' mean visual imagery ratings correlated significantly between pieces, as illustrated in Table 7. This was less frequently the case for engagement ratings, which only correlated between a selection of pieces and at generally weaker strengths.

Table 7. Correlations between pieces for engagement and visual imagery ratings.

Piece	Task	Piece					
		Debussy		Leginska		Prokofiev	
		Engag.	Visual Imagery	Engag.	Visual Imagery	Engag.	Visual Imagery
Leginska	Engagement	$r = .37^*$ $n = 33$		1			
	Visual Imagery		$r_s = .45^{**}$ $n = 34$		1		
Prokofiev	Engagement	$r = .26$ $n = 32$		$r = .02$ $n = 32$		1	
	Visual Imagery		$r_s = .59^{***}$ $n = 32$		$r_s = .43^*$ $n = 32$		1
Rachmaninov	Engagement	$r = .44^*$ $n = 33$		$r = .11$ $n = 33$		$r = .36^*$ $n = 33$	
	Visual Imagery		$r_s = .57^{***}$ $n = 34$		$r_s = .48^{**}$ $n = 34$		$r_s = .77^{***}$ $n = 32$

Note. Values in bold indicate significant correlations. * $p < .05$, ** $p < .01$, *** $p < .001$

Mean engagement while listening to Leginska and Prokofiev showed particularly strong correlations to participants' Gold-MSI's *General Sophistication* scores: respectively, $r_s = .50, p = .003$ ($r_s^2 = 25\%$); and $r_s = .51, p = .002$ ($r_s^2 = 26\%$). Mean engagement while listening to Debussy also correlated with

²¹ Missing data was excluded pairwise in the correlation analyses, in order to maximise the use of valid data. Instead, listwise deletion applied to the ANOVA analyses.

the Gold-MSI *General Sophistication*, yet at weaker levels: $r_s = .36$, $p = .041$ ($r_s^2 = 13\%$). The Gold-MSI's *Active Engagement* battery (one's involvement in music-related activities, such as music listening, reading or attending music events) showed medium to strong positive correlations with most pieces' engagement means—further correlations between the Gold-MSI batteries and participants' mean engagement ratings are provided in Table 8.

Table 8. Correlations between absorption, engagement ratings per piece, and subscales of the Gold-MSI.

Engagement Ratings		Goldsmiths Musical Sophistication Index Scores					
		Active Engagement	Perceptual Abilities	Musical Training	Emotions	Singing Abilities	General Sophistication
Debussy	$n = 33$	$r = .35^*$	$r = .12$	$r_s = .43^*$	$r = .20$	$r = .25$	$r_s = .36^*$
Leginska	$n = 33$	$r = .55^{**}$	$r = .21$	$r_s = .34$	$r = .40^*$	$r = .32$	$r_s = .50^{**}$
Prokofiev	$n = 33$	$r = .39^*$	$r = .36^*$	$r_s = .49^{**}$	$r = .26$	$r = .66^{***}$	$r_s = .51^{**}$
Rachmaninov	$n = 34$	$r = .25$	$r = -.12$	$r_s = .29$	$r = .16$	$r = .17$	$r_s = .14$
Absorption	$n = 34$	$r = .54^{**}$	$r = .18$	$r_s = .35^*$	$r = .51^{**}$	$r = .51^{**}$	$r_s = .45^{**}$

Note. Values in bold indicate significant correlations. * $p < .05$, ** $p < .01$, *** $p < .001$

3.3.3.2 Liking and Absorption

Prokofiev's liking scores also correlated with various subscales of the Gold-MSI, with the *General Sophistication* battery correlating at $r_s = .62$, $p = .000$ ($r_s^2 = 38\%$). Leginska and Prokofiev also emerged as the only two pieces correlating their liking ratings with the Gold-MSI's *Active Engagement*, with $r_s = .46$, $p = .007$ ($r_s^2 = 21\%$) for Leginska, and $r_s = .45$, $p = .008$ ($r_s^2 = 20\%$) for Prokofiev.²²

The mean absorption ratings correlated with five out of the six sections of the Gold-MSI, the strongest being *Active Engagement*, $r = .54$, $p = .001$ ($r^2 = 29\%$). The absorption scores did not correlate with any visual imagery or engagement ratings, but weakly correlated to the pieces' liking ratings. Stronger positive correlations were present, instead, between liking and engagement ratings (Table 9).

²² Also the Gold-MSI's *Musical Training* battery strongly correlated with Prokofiev's liking ratings ($r_s = .68$, $p < .001$), in addition to—although more weakly—Rachmaninov's liking ratings ($r_s = .38$, $p = .027$).

Table 9. Correlations between participants' mean engagement and liking ratings per piece, and liking ratings and absorption scores.

Engagement Ratings	Liking Ratings			
	Debussy	Leginska	Prokofiev	Rachmaninov
Debussy	$r_s = .84^{***}$ $n = 33$			
Leginska		$r_s = .60^{***}$ $n = 33$		
Prokofiev			$r_s = .82^{***}$ $n = 33$	
Rachmaninov				$r_s = .71^{***}$ $n = 34$
Absorption	$r_s = .49^{**}$ $n = 34$	$r_s = .37^*$ $n = 34$	$r_s = .35^*$ $n = 34$	$r_s = .42^*$ $n = 34$

Note. No significant correlations emerged between absorption scores and engagement ratings.
* $p < .05$, ** $p < .01$, *** $p < .001$.

3.3.3.3 Spontaneous Use of Imagery Scale Scores

No significant correlations emerged with the *Spontaneous Use of Imagery Scale* questionnaire (SUIS). The correlation coefficients between *Spontaneous Use of Imagery* scores and mean engagement/visual imagery ratings were mostly weak positive (Debussy: engagement, $r = .10$, $p = .575$; imagery, $r_s = .13$, $p = .457$. Leginska: engagement, $r = .20$, $p = .276$; imagery, $r_s = .04$, $p = .838$. Rachmaninov: imagery, $r_s = .03$, $p = .866$), with weak negative coefficients on three instances (Prokofiev: engagement, $r = -.10$, $p = .588$; imagery, $r = -.04$, $p = .839$. Rachmaninov: engagement, $r = -.08$, $p = .648$). Mostly weak negative correlations that did not reach significance were observed between SUIS scores and the Gold-MSI subscales (correlation coefficients ranging from $-.33$ to $.17$), whilst SUIS and absorption scores correlated positively but weakly ($r = .22$, $p = .210$).

3.3.3.4 Familiarity Ratings

Predictably, the familiarity ratings for most pieces positively correlated between them; this was also the case amongst the familiarity ratings of the pieces' musical styles, summarised in Table 10. Therefore, participants who rated higher familiarity for a particular piece or musical style were also likely to be more familiar with the other pieces/musical styles.

Table 10. Correlations between pieces' familiarity ratings, as well as correlations between the familiarity ratings of the pieces' musical styles.

Familiarity		Familiarity Ratings					
		Debussy		Leginska		Prokofiev	
		Piece	Style	Piece	Style	Piece	Style
Leginska	Piece	$r = .21$		1			
	Style		$r_s = .36^*$		1		
Prokofiev	Piece	$r_s = .47^{**}$		$r = .29$		1	
	Style		$r_s = .47^{**}$		$r_s = .67^{***}$		1
Rachmaninov	Piece	$r_s = .58^{***}$		$r_s = .36^*$		$r = .45^{**}$	
	Style		$r_s = .55^{**}$		$r_s = .42^*$		$r_s = .59^{***}$

Note. Values in bold indicate significant correlations. * $p < .05$, ** $p < .01$, *** $p < .001$

3.3.3.5 More and Less Musically Experienced (ANOVA)

On average, as hypothesised, more musically experienced participants' engagement and visual imagery ratings were higher than the less musically experienced, as observed from the two groups' series displayed in Figures 10, 13, 15 and 17. Two repeated measures ANOVAs²³ were separately conducted for engagement and visual imagery ratings, with a between-subjects factor of more/less musically experienced, and within-groups factor of piece (Debussy, Leginska, Rachmaninov and Prokofiev).

The first ANOVA, performed on engagement ratings, showed a significant between-subjects effect (more musically experienced group: $M = 72.54$, $SD = 14.86$; less musically experienced group: $M = 52.97$, $SD = 14.86$)²⁴: $F(1,30) = 13.89$, $p = .001$, ($\eta_p^2 = .32$), indicating significantly higher engagement ratings from the more musically experienced participants. Within subjects, 'piece' was also a significant effect: $F(3,90) = 10.60$, $p < .001$ ($\eta_p^2 = .26$). Pairwise comparisons (Bonferroni-adjusted) were conducted to determine the details of this effect: Leginska's engagement ratings emerged as

²³ Note. As specified earlier, the mean visual imagery scores for Debussy, Leginska and Rachmaninov significantly deviated from the normal distributions, according to the Shapiro-Wilk test; for these groups, most z-scores for skewness and kurtosis were under or only slightly over the recommended ± 1.96 boundary to assume normality in small samples (Field, 2013). An exception is the z-score for skewness in Leginska's imagery ratings, which deviates more pronouncedly ($z = 3.79$). Nonetheless, ANOVA has frequently been described as a robust test against minor to moderate violations of normality, as recently further supported in Blanca et al. (2017). In addition, the homogeneity of variance assumption has been met by the data, further reducing the possibilities of a Type I error. According to Kirk (2013), moderate departures from normality are not a concern, 'provided that the populations are homogeneous in form' (p. 99).

²⁴ As a result of some participants' missing data in certain pieces/tasks (earlier specified), the ANOVA performed on the engagement ratings totalled 16 participants per more/less musically experienced group; whilst the ANOVA performed on the imagery ratings totalled 17 more musically experienced participants, and 15 less musically experienced. Such data loss is nonetheless random, linked to software issues or participants' forgetfulness to complete the listening task—as opposed to a selective loss related to the participant's refusal to complete the task.

significantly lower than each of the other three pieces' engagement ratings, observable in Figure 21 (p -values $< .001$ for comparisons with Debussy's and Rachmaninov's engagement ratings; and $p = .038$ with Prokofiev's engagement ratings). Pairwise comparisons among the other pieces, however, did not statistically differ between them. The interaction between the piece and participants' musical experience was not statistically significant, $F(3,90) = .22, p = .883$ ($\eta_p^2 = .01$), suggesting that, overall, no significant differences emerged in the way the more and less musically experienced groups rated individual pieces for engagement.

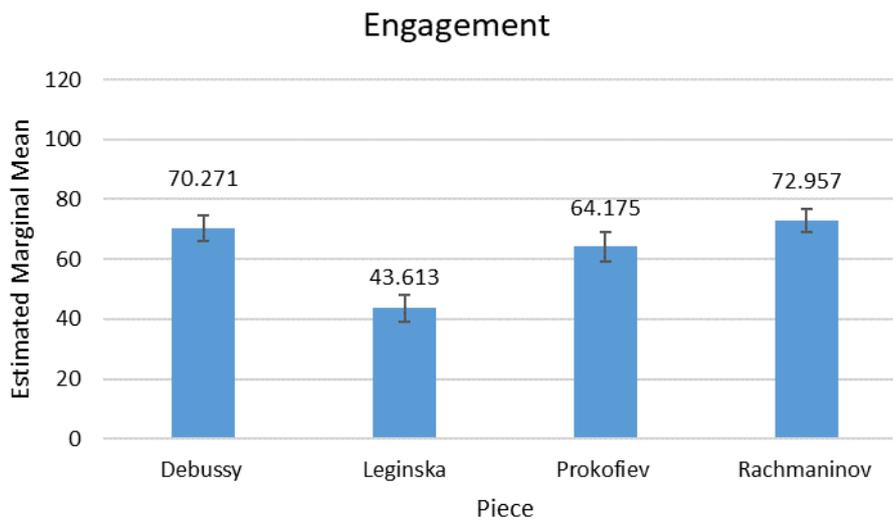


Figure 21. Estimated marginal means of participants' engagement ratings, as derived from the repeated measures ANOVA's main effect 'piece'. Error bars report the standard error of the mean.

The second ANOVA was conducted on participants' ratings of visual imagery. Whilst more musically experienced participants averaged higher imagery ratings than the less musically experienced group, interestingly, this difference was not statistically significant (a comparison of the groups' average ratings, as obtained from the two ANOVAs, may be observed in Figure 22): $F(1,30) = 2.01, p = .17$ ($\eta_p^2 = .06$). Once again, 'piece' was a significant within-subjects effect: $F(3,90) = 9.13, p < .001$ ($\eta_p^2 = .23$); Bonferroni-adjusted pairwise comparisons indicated that Leginska's visual imagery ratings were significantly lower than imagery ratings for Debussy ($p = .048$) and Prokofiev ($p = .001$), but not Rachmaninov ($p = .108$); visual imagery ratings for Prokofiev, however, were significantly higher than those for Rachmaninov ($p = .007$) (see Figure 23). Consistent with the results from the previous ANOVA, the interaction piece x musical experience for visual imagery ratings was also not significant: $F(3,90) = .58, p = .627$ ($\eta_p^2 = .02$).

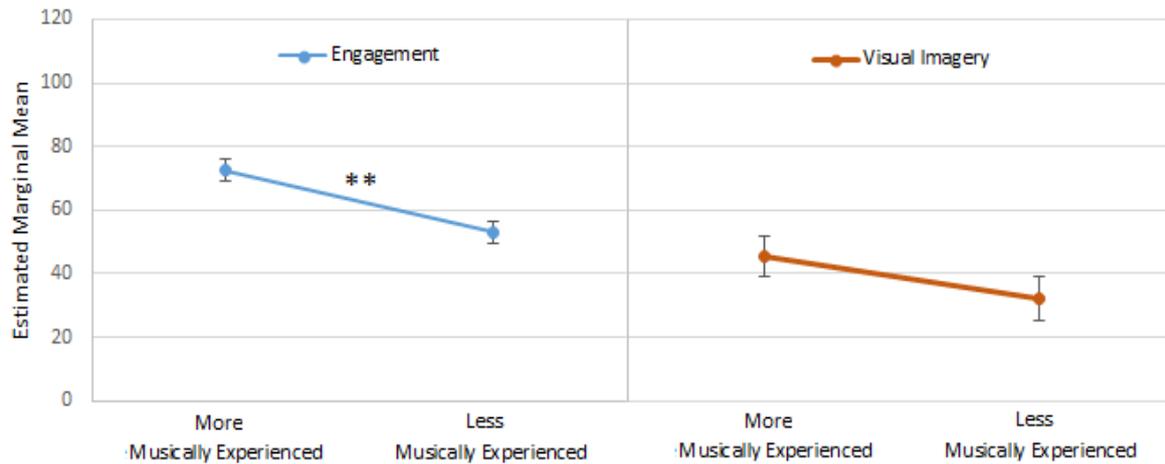


Figure 22. Comparison of the estimated marginal means from the more/less musically experienced groups, as derived from the ANOVAs independently performed on participants' engagement ratings (left) and visual imagery ratings (right). Only the difference in engagement ratings between the two groups was statistically significant (** $p < .01$). Error bars report the standard error of the mean.

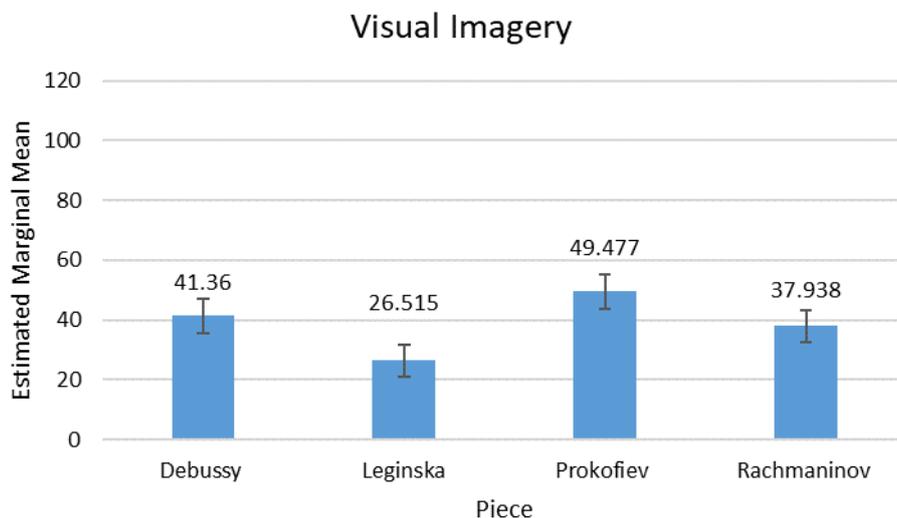


Figure 23. Estimated marginal means of participants' visual imagery ratings, as derived from the repeated measures ANOVA's main effect piece. Error bars report the standard error of the mean.

3.4 Discussion

This study has established a positive relationship between experiencing visual imagery and feeling engaged: this result was obtained while listening to nineteenth and twentieth century compositions for the piano; and for listeners who had been classified as both more and less musically experienced. Details of the nature of the relationship between listeners' engagement and their experience of visual imagery were obtained through Granger Causality tests. Overall, engagement mostly predicted visual imagery, but differences by piece and musical experience were apparent. When

groups were divided into more and less musically experienced, visual imagery predicted ratings of engagement mostly for the less musically experienced group, whilst engagement predicted visual imagery more often for the more musically experienced group. Significant lags ranged between 2 and 7, representing 1 to 3.5 seconds, although larger significant lags also occasionally emerged (see Appendix 7). However, these results appear to vary by piece, and further research is needed to explore whether there are any musical properties associated with the nature of the relationship between engagement and visual imagery. The BRECVEMA framework (Juslin et al., 2010; 2013) might predict that visual imagery precedes an emotional response, which could in turn enhance the listener's engagement. Alternatively, a certain degree of engagement with the music might be needed for visual imagery to occur. Factors shaping engagement with the music in the first place might include the degree of musical experience, familiarity with its style, as well as liking and the propensity to become absorbed.

More musically experienced participants reported overall greater levels of engagement and visual imagery than less musically experienced individuals, though this difference was only significant for ratings of engagement. A possible explanation for these results may be the greater variance in imagery response and their averaged scores. In addition, due to the complex nature of this variable, the reduction of a continuous imagery series to a single mean may not be as effective as, for instance, the averaging of an engagement series. Indeed, varying experimental methods for visual imagery would be fruitful for further work in the field; for instance, whether averaged continuous series would considerably differ from self-reported single values, since research suggests that mean values derived from continuous data are generally lower than the values recorded when participants are asked to provide single summative scores (Brittin & Duke, 1997). Nevertheless, the overall higher visual imagery ratings from more musically experienced participants are in line with recent findings from Tavernaro (2016), which showed a correlation between listeners' visual imagery experience scores (composite score of imagery vividness, ease of imagery and time spent imaging) and the Gold-MSI's *General Sophistication* battery. Similarly, Küssner and Eerola's (2017) three visual imagery factors, as well as participants' VVIQ ratings, correlated with the *Emotions* battery of the Gold-MSI. It seems therefore that those with greater musical experience might have a stronger tendency to experience visual imagery while listening to music. Interestingly, the *General Sophistication* battery of the Gold-MSI also showed stronger positive correlations with ratings of engagement for the pieces by Prokofiev and Leginska: these pieces are characterised by more complex, unusual harmonies and frequent use of dissonances. These are possibly works that are less familiar, and hence less accessible, to less musically experienced individuals.

The correlation of mean visual imagery ratings between pieces suggests that those who rated high levels of imagery for a particular piece, were also likely to rate high levels in other pieces. However, there was a surprising lack of correlation between the *Spontaneous Use of Imagery Scale* and any of the imagery ratings. Perhaps the experience of visual imagery while listening to music is qualitatively different to the experience of imagery in everyday life. Findings from this study are however consistent with literature suggesting that music serves to facilitate visual imagery (Quittner & Glueckauf, 1983; Band, 1996; Osborne, 1981). On the other hand, it is also possible that, due to the complex properties of imagery and its rating, such grand mean levels (as obtained from averaging the entire continuous rating into a single mean) present greater challenges in producing an effective, representative mean value—particularly in relatively small samples.

With respect to mean engagement, these ratings were less strongly correlated among pieces. Mean engagement ratings positively correlated with participants' liking of the pieces, suggesting that engagement with the music increases in line with its appreciation. Whilst engagement correlated with liking ratings, it is important to bear in mind that this is not necessarily always the case; one participant commented on Prokofiev's piece in the interview:

“It's quite a repetitive piece, and the intensity builds and builds and builds, but you can't help but, you know, listen to it. It's engaging but in an irritating way, and I think that's what it's supposed to be doing” (Gregory).

The positive relationship of engagement with visual imagery in the current research requires further clarification in other research domains of visual imagery. For instance, the discrepancy between mind wandering-related imagery—characterised by attention drifting away from any external task and its independence from perception (Smallwood & Schooler, 2015)—and the focused imagery of heightened engagement which can occur during music listening. Indeed, these discussions, alongside further research, are to be moved forward—also pursued later in this thesis. Nonetheless, the current study has provided initial empirical support for an association between the two.

3.5 Limitations

The internalised, subjective nature of visual imagery experience makes it a complex phenomenon to investigate, and various limitations apply to the current study. Whilst the experimental tasks were designed to minimise complex, invasive tasks, asking respondents to be consciously aware of, and then to rate, their engagement with the music they were listening to risks removing them from their engaged state in order to respond. Analysis of the qualitative data gathered (discussed in the next chapter) showed how some individuals found rating their experience of visual imagery easier than

others, feeling more or less able to accurately describe its content. An opportunity for future research could therefore involve the use of indirect measures; engagement responses, for instance, could be compared with other physiological measures. This could also help to investigate into greater detail the effects of asking participants to follow a specific task; although the wording of the instructions has been carefully considered in the present research, these may nonetheless influence, to varying degrees, participants' responses. Indeed, asking participants to focus on specific aspects of their responses, such as visual imagery, presents an important limitation of this study. However, insights into participants' imagery experiences can only be gained through their subjective, self-reported accounts, as a result of the complex, internalised nature of the phenomenon. In this respect, numerous other studies would be subject to the same criticism. Nevertheless, the present research intends to provide initial steps towards a greater understanding of visual imagery experiences, with a view to develop explorations and the use of alternative experimental designs—possibly in a more ecologically valid music listening context. Present findings are nonetheless optimistic, since visual imagery was associated with engagement in both the time series analysis presented in this chapter, and in various instances across the qualitative data gathered (Chapter 4).

Arguably, other research may prefer to investigate visual imagery through a binary approach (present or not present). Yet, continuous levels of imagery provided insightful details when related to the musical content; this enabled, for instance, the identification of areas in the music rated particularly highly by the sample. Although the study relies on self-reported data—one's reported engagement at a certain height of the slider is likely to differ from another participant's at that same height—nonetheless, averaging responses enabled the emergence of overall highly rated moments in the music by the sample, overcoming (to a certain extent) such differences.

Another limitation of this study is the possible fatigue and distraction on the parts of participants in completing the various listening tasks. Whilst each stimulus was selected for its relatively short length, participants were nonetheless required to listen to each piece twice, lengthening the overall experimental session. Nonetheless, the experimental procedure was designed with an attempt to reduce, to its possible extents, participants' fatigue: the placement of brief questions (e.g. Likert ratings of the piece's familiarity) between pieces created a more varied sequence of tasks. Moreover, the second listening task of a piece did not follow immediately after its first hearing/listening task; instead, the four pieces were repeated as a sequence, leaving more space between the first hearing of a certain piece and its second hearing.

Music stimuli in the present study focused on solo piano works, maintaining instrumental timbre as relatively fixed. There is, however, potential for further research in investigating the effects of different instrumental timbres on imagery responses. The study also involved a relatively small sample, with regards to the quantitative data collected. This was particularly noticeable across the pieces' familiarity ratings: the large majority of participants were unfamiliar with the musical works, resulting in a lack of response variation which could impede further insights into the influence of this variable. The exploratory nature of this study aimed at gathering a varied sample group. No prerequisites were required for participation to the study; any individual was able to participate, regardless of their age, musical background or preference for particular musical styles. Future research may explore individual differences in relation to more specific sample groups and direct their attention to the possible influence of different cultural backgrounds.

Chapter 4. Empirical Study 1: Visual Imagery Types

Following the quantitative findings reported in Chapter 3, this chapter focuses on the qualitative component of the same empirical study. Participants' written annotations on their visual imagery experiences in response to the four musical works are thematically analysed and discussed. Nine broad themes emerged in relation to the way participants experienced visual imagery during music listening, here referred to as 'visual imagery types'. In line with the scope of the overall study, the observations reported are exploratory in nature, providing room for further development and refinement. Nevertheless, the emerging visual imagery types should furnish useful and intriguing starting points for future investigations.

4.1 Qualitative Data: Method

The present study aimed to gain an exploratory insight into listeners' subjective experiences of visual imagery and engagement during music listening. The research design and analytical approach were therefore considered primarily, but not strictly, through a phenomenological lens. Phenomenological research aspires to capture the quality and texture ('what it is like') of participants' subjective experience, and assumes that the same event may be experienced in different ways by different individuals (Willig, 2013:16). Thematic analysis (TA; Braun & Clarke, 2006; Nowell et al., 2017) was deemed most suitable for the exploratory nature and purpose of this research. Thematic analysis can capture and summarise significant features across a large and diverse data sample, providing a sufficient flexibility to analyse and present 'a rich and detailed, yet complex account of data' (Braun & Clarke, 2006:78). This enables the identification of themes emerging as important in describing the phenomenon (Fereday & Muir-Cochrane, 2006; Daly, Kellehear & Gliksman, 1997), or aspects of it, through the use of various sources and information (Boyatzis, 1998:12). In the following study, the thematic analysis employed combined a mixed approach of both inductive ('bottom up') themes—which formed the majority of the qualitative themes that emerged—in addition to some elements of literature-led themes. Hence, thematic analysis enabled a combination of descriptive and interpretative coding, allowing new ideas to emerge from the data whilst acknowledging previous research and musicological knowledge.

Free written annotations from participants were transcribed (in the case of drawn annotations, these were electronically scanned) and qualitatively analysed with the use of NVivo software. Due to the large amount of data generated from this study, face-to-face interviews were not included as

part of the thematic analysis. Instead, they served as supplementary material to clarify and gain further insights into participants' written annotations.²⁵ Additionally, interviews were helpful in providing a sense of *when* a particular imagery emerged in relation to the music being heard, allowing closer observations between musical features and types of mental images experienced. Finally, it should be acknowledged that the process of analysing and identifying themes 'is inevitably influenced by the assumptions, interests and aims of the researcher' (Yardley, 2008:242). Indeed, the researcher's background as a classical performer, as well as her personal understanding of visual imagery in relation to music listening, have shaped the interpretation of the data presented in this study. Nonetheless, while being aware of the personal musical intentions and insights gained in recording the study's audio stimuli, the researcher endeavoured to maintain a detached stance from the data to enable the emergence of participants' ideas and themes. This was to allow the study to follow Yardley's (2008) principles for evaluating the validity of qualitative research: for instance, by remaining sensitive to the context, being aware of relevant theoretical/empirical literature and participants' perspectives; and maintaining transparency, that is, transparent use of methods and data presentation (pp. 243–244). As discussed below, the process of analysis maintained a consideration of 'the ways in which [participants'] views are expressed' (Ibid.:247); while Section 4.2.1 provides a detailed review on the identification, coding and content of each qualitative theme alongside extracts from participants' annotations, with the purpose of clarifying and elucidating the choices undertaken as part of the research process.

Qualitative explorations of visual imagery in music listening frequently focus on the content and types of the imagery created (as in Band, Quilter & Miller, 2001; or Küssner & Eerola, 2017, for instance). Such accounts often report descriptions of the mental images that emerged (e.g. landscapes, shapes, etc.), the visual details involved (e.g. bright colours) or the quality of the image (e.g. vividness), offering insightful information on the wide-ranging variety of imagery experiences. Nonetheless, there is more to the complex phenomenon of visual imagery than the resulting imagery itself; and when these experiences emerge in the course of music listening, the imagery process may be influenced, to varying extents, by additional factors. As Herbert (2011) notes, 'music provides a versatile platform for imaginative involvement via the evocation of personal associations and reminiscences, and musical "codes" or "topics" may act as short-hands that bring to mind a range of historical and cultural references' (Herbert, 2011:181–2). Küssner & Eerola (2017) moved further in exploring different types of imagery, reporting three factors that accounted for music-related visual imagery: realistic, abstract, and absorbing imagery (as discussed earlier, Sections 1.2.2

²⁵ As mentioned earlier, interviews extracts will be cited in "*double quotation marks and italics*"; extracts from written annotations will be reported in 'single quotation marks'.

and 2.2.3). The content of participants' visual imagery responses is also included in the qualitative investigations of the present study. However, the following thematic analysis employed a slightly different approach: to explore participants' subjective experiences of visual imagery by means of the possible ways in which visual imagery may emerge during music listening, giving rise to different kinds of mental images. These 'ways', later reviewed, have been defined in this study as 'visual imagery types'.

4.2 Qualitative Data Analysis

4.2.1 Visual Imagery Types

The thematic analysis conducted on participants' free annotations suggested that participants experienced visual imagery that may be described within nine broad visual imagery types: (1) *arbitrary* (seemingly random responses); aural associations comprising (2) (shared) *musical topics* or (3) (idiosyncratic) *sound associations*; (4) *emotions*; (5) *material abstraction*; (6) *narratives*; (7) *performance* (performance-related aspects or perspectives); (8) *personal recollections*; and (9) *pictorial associations*. While these visual imagery types focus on different aspects of participants' imagery experience, they can nonetheless overlap (further discussions below).

Visual imagery can be a multifaceted experience for each individual. Participants' free imagery annotations generated wide variety within the data collected, both in terms of content, as well as the ways in which the imagery was expressed. This is not surprising, since imagery responses may be influenced by numerous factors, such as personal experiences, or the effects of culture and learning, as pointed out in Juslin's theoretical model (Juslin, 2013; Juslin et al., 2010). Other imagery experiences, although limited, may even relate to universal responses in music processing,²⁶ a research area meriting further exploration.

Despite the considerable complexity of this phenomenon, an intriguing finding from this study was the emergence of recurring mental images across a number of participants, with different types of recurring images emerging in different pieces (see below on *shared musical topics*). Furthermore, the way imagery responses often appeared to be tied to the content of the musical work, as emerged throughout the discussion below, highlights the significant role of the music as part of the listening experience. Some of the mental images described seemed more obviously related to the musical work (or its musical features) than others. For instance, imagery themed as *musical topics* is likely to stand out as more closely related to the music than the seemingly random imagery

²⁶ For a broader discussion on universal responses to music, see Stevens and Byron (2016).

responses from the *arbitrary* theme—although such perceptions may vary in the mind of the participant experiencing the imagery.

It is not within the scope of this study to determine the extent to which the different kinds of visual imagery types reported below may be associated more or less directly with specific aspects of the music. However, the study acknowledges the complexity and diversity of responses. An alternative consideration in regards to the large variety of imagery experiences could, instead, be captured in terms of the individuality of the imagery: through this lens, it is possible to observe the way the sample's visual imagery ranges from highly 'personal', idiosyncratic imagery experiences to more widely 'shared' mental images or themes, recurrent across different listeners for the same musical work. Once again, some visual imagery types may incline towards either ends of the scale, comprising greater extents of shared or personal content than others—for instance, musical topics-related imagery are more likely to recur among different listeners; while the *personal recollections* type would typically enclose imagery of a more idiosyncratic nature. Yet, when mental images are considered collectively within a sample, the 'personal' to 'shared' continuum could nonetheless apply to any of the visual imagery types, since any of the themes below may capture both recurring as well as individual imagery experiences—a certain musical topic may be perceived or emerge only in the imagery response of a single participant;²⁷ or again, memories and past events may be recalled collectively, if different individuals shared a particular experience related to a specific piece. A visual summary of the qualitative themes may be observed in Figure 24.

²⁷ Whilst all visual imagery types may involve personal and shared imagery, for consistency purposes and clear coding parameters, the *musical topics* visual imagery type reported in this study will focus exclusively on the shared aspect (further information is provided in the *musical topics* discussion below).

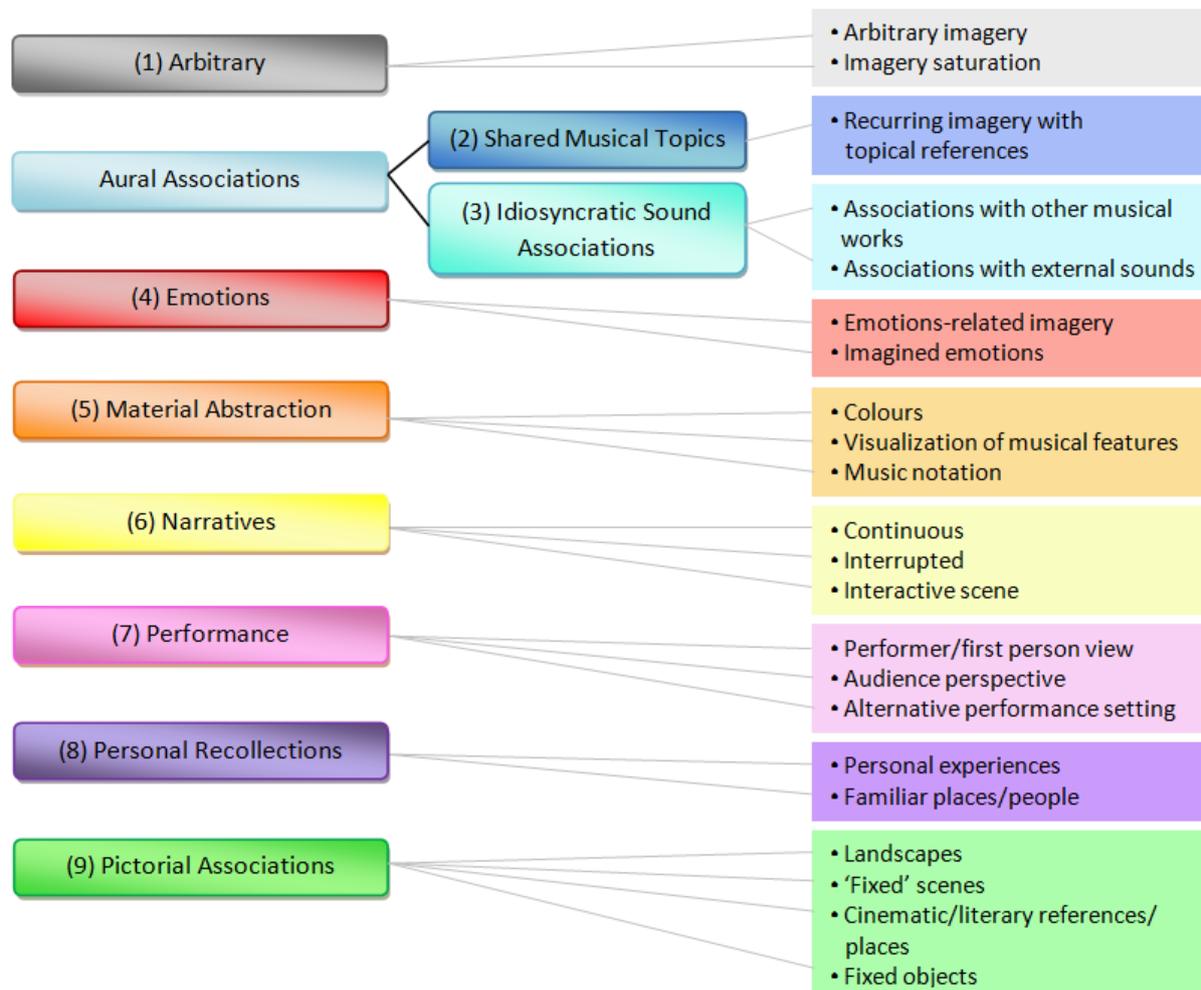


Figure 24. List of 'visual imagery types' in music listening, which emerged from the thematic analysis of participants' written annotations describing their visual imagery experiences.

The following section provides further insight into each of the nine visual imagery types. In order to clarify the researcher's thematic coding process, a summary of each theme's definition, coding benchmarks and sample extracts from the data have been included. As earlier mentioned, while each visual imagery type focuses on different aspects of participants' visual imagery experiences, categories were not all mutually exclusive and content overlaps occurred. Hence, if a specific imagery was relevant (for different purposes) to two visual imagery types, the same imagery would be double coded (details on coding overlaps are reported in Section 4.2.4.5). That being said, in some instances, the type of content captured by some visual imagery types did not allow any overlaps between them. For instance, coding for the shared *musical topics* and idiosyncratic *sound associations* did not overlap at any time: although both types placed especial emphasis on aural associations, *musical topics* focused (in the present analysis) on shared imagery experiences; on the other hand, *sound associations* concerned associations to external musical works, or other

idiosyncratic sound associations. Similarly, *pictorial associations* maintained a distinctive coding that did not overlap with any of the other visual imagery types, for the reasons outlined below.

Due to the sophisticated nature of the phenomenon, coding for each visual imagery type required a certain degree of flexibility. This was an inevitable part of the analysis process, since the fluidity and breadth of imagery experiences challenged the use of an entirely fixed, rigid coding system. Furthermore, details of the various imagery experiences relied on self-reports and participants' ability to express these: listeners should be 'comfortable enough with using words to articulate aspects of experience that would not ordinarily be filtered through language' (Herbert, 2011:vii). Ways in which imagery experiences were expressed and articulated therefore varied greatly among participants, and this had to be considered throughout the data's analysis. What may have been a suitable thematic guideline for one participant's imagery description might not have applied exactly in the same manner to another, due to the way the imagery was described—in spite of their shared thematic content. However, such exceptions have been included below, alongside pertinent data examples. Table 11 lays out the details of the 34 participants' age, sex and musical experience group;²⁸ to preserve anonymity, a pseudonym has been randomly assigned to each participant. To allow an understanding of the reported imagery's musical context, the relevant piece is specified in (brackets) at the end of each imagery annotation,²⁹ alongside the participant's pseudonym.

²⁸ See the Introduction and Section 3.2.2 for this thesis' definition of 'musical experience', and further details on how participants were assigned more/less musically experienced groups.

²⁹ Any square brackets within participants' citations indicate spelling corrections adjusted by the researcher, or specifications by the latter.

Table 11. Study 1 participants' pseudonyms, demographic and musical experience group details.

N.	Anonymous ID	Age	Male/Female	More / less musically experienced
1	Adam	23	M	More
2	Barbara	41	F	More
3	Carlo	23	M	More
4	Denise	29	F	More
5	Emma	31	F	More
6	Florene	30	F	More
7	Gregory	21	M	More
8	Hector	23	M	More
9	Ian	48	M	More
10	Jasmine	48	F	More
11	Kalvin	27	M	More
12	Leo	21	M	More
13	Mark	72	M	More
14	Nicolai	69	M	More
15	Oliver	26	M	More
16	Phoebe	42	F	More
17	Quinn	26	M	More
18	Albert	40	M	Less
19	Brenda	28	F	Less
20	Christopher	35	M	Less
21	Diego	26	M	Less
22	Enzo	46	M	Less
23	Fredric	55	M	Less
24	Grace	32	F	Less
25	Helena	22	F	Less
26	Imogen	23	F	Less
27	Julia	25	F	Less
28	Kate	28	F	Less
29	Lucy	42	F	Less
30	Margaret	30	F	Less
31	Nigel	34	M	Less
32	Oscar	37	M	Less
33	Portia	50	F	Less
34	Qiana	56	F	Less

Note. F = Female, M = Male; More = More musically experienced, Less = Less musically experienced.

(1) Arbitrary

Visual imagery type description. Sporadic or erratic visual imagery of content that was seemingly unrelated to the musical context in which they were experienced.

Coding details. This imagery type emerged from visual imagery that markedly deviated from its related musical context, thus appearing as seemingly random responses. As previously discussed (Chapter 2), visual imagery is also associated with the phenomenon of mind wandering, that is, a mind's ability to stray away from the external environment (Smallwood & Schooler, 2015) and generate stimulus-independent thought (Killingsworth & Gilbert, 2010). Therefore, it may be possible that not all of the imagery experienced necessarily related to the musical context in which it emerged. Occasionally, some participants also expressed their surprise with the content of their imagery (an example of this is reported below). Further arbitrary imagery responses included a sort of imagery saturation: annotations that described a rich list of extremely varied, and largely unrelated, images.

Although this imagery type captured particularly unusual examples of imagery, it is nonetheless necessary to appreciate the high degree of subjectivity involved in this category, and the need of interpreting such imagery with caution. It may also be possible that, whilst the researcher may regard a certain imagery as unrelated to the musical context, this may not necessarily be the case for the listener who conjured up the imagery. For this reason, the 'arbitrary' theme was formed from an independent, additional layer of coding, which overlapped and acted independently from the other imagery types: that is, all material coded as 'arbitrary' therefore also appeared under another imagery type (including *pictorial associations*, where relevant). Despite the theme's possible degrees of subjectivity and low coding presence across the data here presented, this kind of imagery formed a valid part of the listening experience. As a result, the emergence of the *arbitrary* imagery type was deemed important and should therefore be reported.

Examples:

- Arbitrary imagery: 'Ponies' (Carlo; *Debussy*).
This participant did not experience any visual imagery in the course of the entire music listening, with the exception of a brief mental image of ponies in the middle of the piece—denoted by the small peak in his imagery series, displayed in Figure 25.
- '...Then my mind went for a wander and the view went from the front to the back [of] the circular [*plinth*]. She was play[ing] the piano [*and*] was swallowed up by a gorilla' (Leo; *Debussy*).

This participant mostly experienced performance-related imagery whilst listening to Debussy, with exception of the mental image described above. The surprising, dramatic twist of this segment appears to deviate significantly from the musical context—out of the four stimuli, Debussy may be regarded as the most optimistic in terms of musical character: minor sections only briefly appear during overall calmer passages of the piece; while the intensified sections would typically suggest grandeur, as opposed to a negative, dramatic tension. Furthermore, it is interesting to notice the participant's own acknowledgment of his mind 'going for a wander', before describing the arbitrary imagery experienced.

- Imagery saturation: 'Vienna. Russia/Prussia. Russian revolution. Love separation. Decadence—war & peace. Peasants + rich. Proust. Golden [*tassels*]. Moustache' (Enzo; *Debussy*).

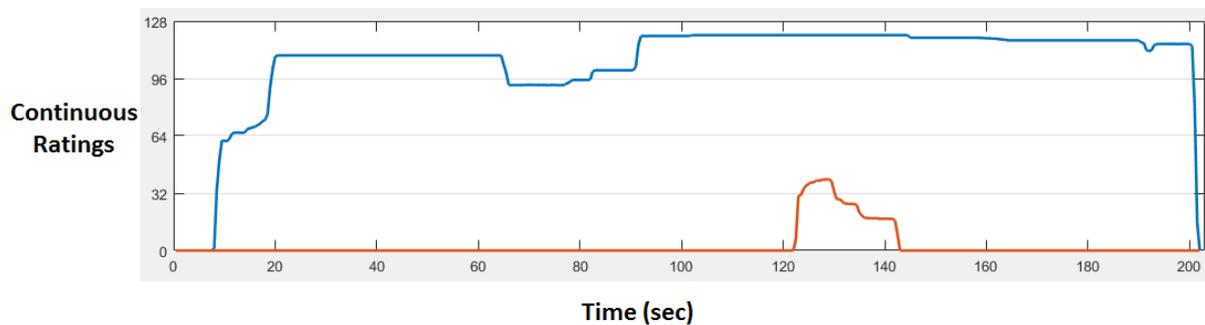


Figure 25. Carlo's continuous ratings for engagement (blue line) and visual imagery (red line) whilst listening to Debussy. Imagery annotations from this participant were coded as arbitrary; his imagery series appears to support a single, brief, 'casual' moment of visual imagery.

Aural Associations

Some of the visual imagery reported by participants seemed to emerge by means of an aural association of some kind. In the analysis reported here, this imagery is divided between recurring, shared *musical topics*³⁰ and idiosyncratic *sound associations*. As a result, it was occasionally possible for certain non-recurrent, topic-related imagery—or, borrowing Lidov's (2012) terms, the 'more singular and original allusion within one composition' (p. 164)—to fall under the idiosyncratic *sound association* coding, if specific aural elements were stressed in the imagery reported. However, the *sound association* visual imagery type predominantly captured different kinds of aural associations, such as links to other musical works (as later discussed). In this research, musical topics were not confined to the widely shared and established topics collection (such as those identified by Ratner, 1980); instead, the data—participants' visual imagery responses—gave rise to the musical topics of each musical work.

³⁰ Additional information on the research's employment of the term is provided in this thesis' Introduction.

(2) (Shared) Musical Topics

Visual imagery type description. Topics have been described as ‘patches of music that trigger clear associations with style, genre and expressive meanings’ (Hatten, 2004:2). Here, the *musical topics* imagery type captured recurring visual imagery content (per piece, and across multiple participants) associated with topical references from the musical works, by means of an aural association. In this theme, topics could include both the more traditional musical topics (such as dances, or the hunt; Ratner, 1980), as well as less conventional, but recurring types of shared mental images across participants for each piece.

Coding details. Music topics encompass a particularly broad area of research. Grabócz (2012:120) defines topics as:

...Signifying musical units which, while being bound to one recurrent musical formula in terms of contour, rhythm, tempo, instrumentation, tonality and so on—refer always to the same expressive content as long as they are kept within one style or the works of one composer.

Similarly, the (shared) *musical topics* imagery type focused on visual imagery which, as a result of the way certain musical features are arranged and organised within the musical works, emerged as shared experiences of similar mental images (or thematic content) across different participants. Whilst certain topics are prevalent across early eighteenth-century music repertoire, modern perceptions of past or recent musical works may give rise to new referential meanings and associations. Such referential meanings may have influenced listeners' visual imagery experiences, to varying degrees; and, as a result, led to shared experiences of particular mental images. It should be emphasised that the broader concept of musical topics covers an extensive range of musical features. An attempt to identify all the possible topics in participants' imagery annotations is far beyond the scope of this study. Instead, coding for this imagery type intentionally and exclusively focused on *shared* topics, with the aim of identifying the kinds of topics that emerged more prominently across different listeners' imagery experiences. After all, as Huovinen and Kaila (2015) point out: topics, as cultural constructs, ‘emerge from our musical environments only as filtered through the understandings of a multitude of individual listeners’ (p. 237). A list of the topics that emerged in this study is set out in Section 4.2.2.

Examples:

- *Dance* topic in Debussy:
 - 'A couple dancing to the sound of music' (Oscar).
 - 'Started [off] with a couple dancing waltz' (Margaret).
 - 'I imagined a grand ballroom (19th century stereotype) in which the upper class dance to the opening strains' (Oliver).
- *Chase* topic in Prokofiev:
 - 'Chase—smaller person/animal trying to get away pursued out of sight by bear/giant. They see them and pursue more catching up—struggle ensues—smaller one escapes into more obstacles end up swept away in water' (Phoebe).
 - 'Someone being chased' (Adam).
 - 'Chase and ? escape from villain' (Nicolai).
- *Birds* singing in Rachmaninov:
 - 'Birds singing/chirping' (Adam).
 - 'Birds singing a song in the trees' (Hector).
 - 'Images of birds moving over green fields' (Albert).

(3) (Idiosyncratic) *Sound Associations*

Visual imagery type description. Visual imagery that emerged from musical or aural associations with previously heard musical works or sounds, and their contexts. Such associations may include links to **other musical works** or aural analogies associating the music, or aspects of it, to **external sounds**.

Coding details. A number of participants specified, at times, the way in which their visual imagery emerged from associations made between the music and other musical works. As a result of these associations, these kinds of images were frequently linked to the context of the (aural) association made. The kinds of visual imagery included in this imagery type do not exclusively concern other musical works, but also specific sounds being associated with external references (some examples are provided below).

As mentioned above, coding for the *sound associations* imagery type did not overlap with *musical topics*; although closely related, the two types focused on two different imagery contents, besides capturing (respectively) 'shared' versus 'idiosyncratic' experiences of aural associations-related visual imagery.

Examples:

- Associations to other musical works: 'March-like theme reminded me of Yann Tiersen's music for 'Amélie' and so thought of Paris... Movement in 3rds reminded me of Howard Blake's 'The Snowman' so winter' (Carlo; *Rachmaninov*).
- 'I imagined scenes from a movie with a soundtrack that sounded similar to it' (Christopher; *Rachmaninov*).
- Associations made to sounds: 'At another point the piano was playing higher and it reminded me of dogs barking and the higher notes came out of a small dog's mouth in a woof!' (Leo; *Prokofiev*).
- 'High-pitched tune was a carousel in the snow' (Carlo; *Rachmaninov*).

(4) Emotions

Visual imagery type description. Visual imagery related to affective responses, or aspects of emotions, which emerged during participants' listening experience; these may include emotions perceived, imagined or interpreted by participants as suggested by the music heard.

Coding details. At times, participants' descriptions of their visual imagery experiences interwove with comments on emotions or affective responses to the music. Indeed, if interpretations of an emotional term are considered, thematic coding related to *emotions* could easily extend considerably—for instance, imagery of a funeral could have been coded as a sad event. Instead, for the sake of consistency and a more focused, useful employment of this code, the following imagery type was confined to visual imagery annotations explicitly referring to affective and emotion-related (or emotionally charged) terminology: these could include participants' own emotional responses to the music, emotions perceived as being expressed by the music, or imagined emotional states.

On a few occasions, participants' annotations comprised brief descriptions of emotion-related aspects of the music, but lacked details of the image conjured up in the mind's eye (for instance, annotations only involving a list of words describing affective responses to the music; whether alone or within a wider list of various imagery descriptions). The experimental instructions in this study asked participants to focus specifically on their visual imagery in their accounts, as opposed to other aspects of their listening experience. Such lack of specificity could be argued to be a result of responses that, as for any experimental setting, can include a certain degree of error related to participants misunderstanding or incorrectly completing the requested tasks. However, the completion of face-to-face interviews enabled further confirmation of whether or not listeners *did* experience any visual imagery. Hence, such comments (which focused on affect and lacked visual

imagery specificity in the written annotations, but where imagery was confirmed in the interview), were nonetheless coded as part of the *emotions* imagery type—these only formed a relatively small portion of the theme (7.91% of the *emotions* coding). If participants reported an emotional response in their written comments, but did not then report a visual response at interview, this response was discarded as being an erroneous response to the task set and was not included in the qualitative analysis presented here—this was only the case for one participant, in relation to one piece. An alternative perspective to this may be that the ambiguity in such descriptions is simply a result of participants' inability to articulate, or even define, the visual imagery experienced—a concern that also emerged in some participants' responses. The use of affective terminology may have served as a shortcut from deciphering the complexities of one's visual imagery process during music listening. Hence, such responses have nonetheless been included under the *emotions* imagery type, supported by participants' continuous ratings of visual imagery, as well as their interview discussion.

There are still uncertainties over whether visual imagery experiences surface from one's emotional response to the music or if affective responses emerge as a result of the visual imagery listeners conjure up—or, yet again, whether the two occur concurrently as part of a more complex process. According to Juslin's (2013) framework, visual imagery precedes an emotional response. On the other hand, Day (2018) proposes the opposing perspective of visual imagery emerging from listeners' emotional experiences. A further perspective may consider a network model, as opposed to a linear one. Further research is required on the matter. Nonetheless, the emergence of this category further confirms the line of research proposing a close link between emotions and visual imagery in music listening.

Examples:

- Emotion-related imagery: 'A theatre and actors miming a story. A sad love story where the characters keep misunderstanding one another. It all ends in tragedy and there are feelings of sadness and remorse at the end' (Portia; *Rachmaninov*).
- 'Old lady remembering her first ball where she was dancing her first [*waltz*], she feels a bit nostalgic and sad, but at the end (cause we hear major key), she becomes happy again' (Florene; *Debussy*).
- Affective-related only/unspecified imagery: 'This piece of music is about an inner personal fight. Arguing between true and untrue...' (Barbara; *Prokofiev*).
- Imagined emotions: 'Always visualise the pianist. What is he feeling' (Kalvin; *Rachmaninov*).

(5) Material Abstraction

Visual imagery type description. Imagery that typically involved visual representation of particular musical features, or that emerged from aspects of the musical material; overall, the following category is comprised of **abstract kinds of imagery, colours** and visualizations of the **music score**.

Coding details. Some participants' experiences of imagery seemed to visually translate specific musical features into different forms of visual representations; examples of this include imagined, dynamic shapes which changed in the course of the music listening (e.g. lines representing melodic contour), as well as attempts to visualise the musical score in the mind's eye (another form of pitch representation). More broadly, the following visual imagery type also aimed to capture the overall abstract forms of imagery that emerged from participants' annotations. Whilst reference to the linked musical feature was often specified by the participant, this was not always the case—coding for the following visual imagery type applied to any form of abstract imagery, regardless of whether a musical feature was specified or not. In addition, some participants, particularly among the less-musically experienced, may have had difficulty in articulating the musical features that could have prompted the abstract imagery; others may have struggled to consciously identifying these.

Material abstractions also included the experience of abstract colours in one's imagery—to differentiate from colourful details of a wider visual imagery context. The association between music and colours has been explored in a number of studies, for instance, the way participants' matching of music and colours seem to be mediated by the shared emotional associations that they evoke (Palmer et al., 2013). In making such music-colour associations, 'individuals appear to evaluate which emotions the music evokes, and then determine the colors that best fit those emotions' (Schloss, Lawler & Palmer, 2008). Other works explore the closer association between colour and particular musical features; for instance, the manipulation of tempo alone can change the colours associated with the piece (Tsang & Schloss, 2010). Further musical aspects which emerged as significant cross-modal associations for both synesthetes as well as nonsynesthetes, include pitch height (Block, 1983), major/minor modes and attack rate (Isbilen & Krumhansl, 2016). Therefore, in view of these studies, there is also the potential for an imagined colour to develop, in varying degrees, from musical features or particular aspects of the musical work.

Examples:

- Colours: ‘Some interesting colours and some strange colours as well’³¹ (Florene; *Leginska*).
- Visualization of particular musical features: ‘I was thinking about the shape of the musical contours. Nothing geometrically vivid but there was something there’ (Leo; *Debussy*).
- ‘Interaction between high and low voices’ (Gregory; *Rachmaninov*).
This was the only imagery experienced by this participant (more musically experienced group) throughout the entire piece. His continuous ratings are displayed in Figure 26: the first and second discrete rise in imagery correspond to the second and third return of the initial theme^m—perhaps, suggesting the possible effects of familiarity with the musical material in visualizing the voicing interaction described. The thematic^m material is slightly varied during the third peak in visual imagery; yet, the ratings drop drastically as textures intensify into a new development of the music.
- Notation: ‘What the notation for the piece may look like if it were moving along with the pace of the performance’ (Oliver; *Prokofiev*).

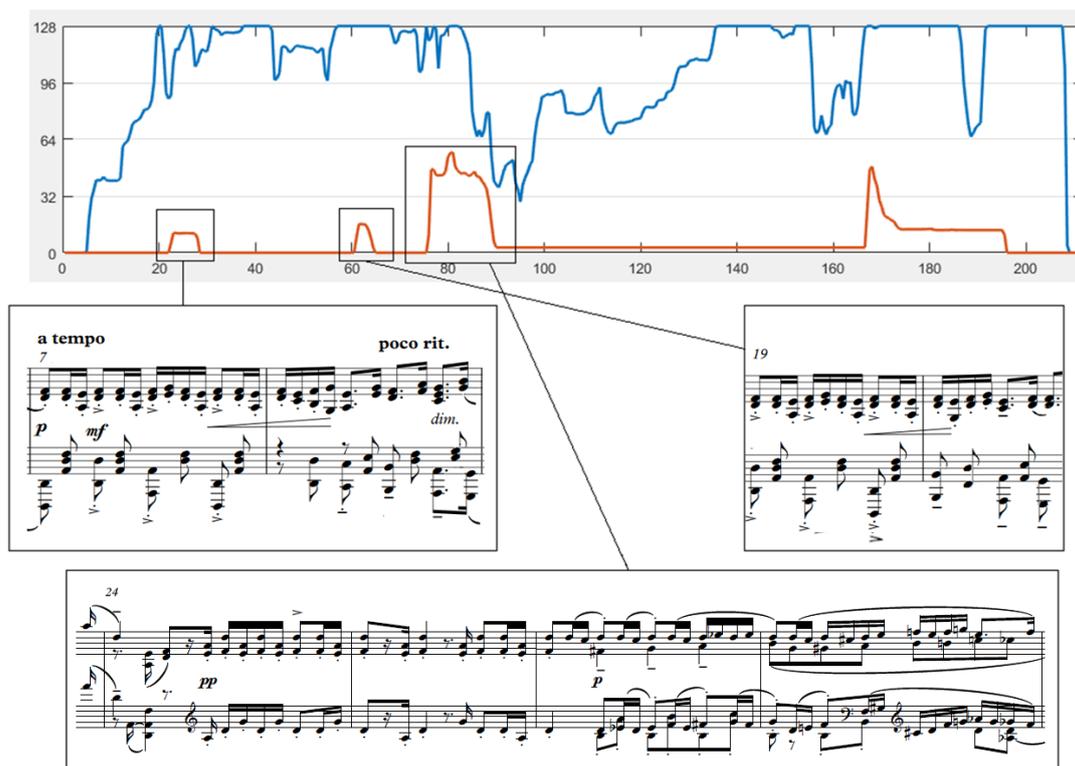


Figure 26. Gregory's (more musically experienced group) continuous ratings of engagement (blue) and visual imagery (red) whilst listening to Rachmaninov. The figure includes music score extracts that coincided with the marked imagery ratings.

³¹ Arguably, this may be regarded as a metaphorical description, than an imagery experience. However, as earlier discussed, this study relies on participants' abilities to report their imagery; instructions in the experimental session also asked to focus on their visual imagery. Florene was perhaps unable to accurately describe the colours experienced—rather than representing a metaphorical language/lack of visual imagery.

(6) Narratives

Visual imagery type description. Visual imagery that comprised a series of related events that followed on from one another, giving shape to an imagined narrative that developed in the course of the musical work. Such narratives could be **continuous**, stretching over the entire musical work, or **interrupted**, such as narratives commencing at an early stage of the music and continued later on, but which were interrupted by a central section of unrelated imagery (in relation to the imagined narrative) or no imagery at all.

Coding details. The following imagery type emerged from descriptions of visual imagery experiences that implied a sequence of related events, often developed with the unfolding of the music. For imagery to be included within the narrative category, a minimum of two related events were used as a general threshold for this category. According to Lavy's (2001) theoretical framework towards understanding emotional responses to music, one of the basic assumptions concerning listeners' relationship to music is 'music heard as narrative'. The construction of narratives is 'central to the human ability to make sense of all facets of the world'; thus, 'music, just like making sense of other stimuli or structures, involves the construction of narratives' (Ibid.:12-13). Building on Lavy's remarks, it may be added that also some of the *visual imagery* conjured up by music listeners may be experienced in the form of a narrative of some kind, as emerged in the current study. Essentially, the function of narratives is to create connections between distinctive fragments of information or different stimuli (Ibid.:12). The types of imagined narratives which emerged here seemed to better conform more convincingly to Meyer's (2001) conception of narrative. Meyer maintains a distinction between 'narrative' and his notion of 'plot': according to the author, a narrative succession may be regarded as a plot when 'uncertainty is experienced in terms of an imagined goal' (Meyer, 2001:357). Yet, a plot is not essential to define a narrative, since the latter can also take the form of a narrative without goals; more precisely, it may be described as 'essentially fluctuating continuities' (Ibid.:357)—a perspective which differs from Lavy's (2001) approach to narratives, which relies on suspense (Daynes, 2007:30; Prior, 2013). Similarly, the narratives that surfaced from participants' annotations were not necessarily structured by dramatic plots, nor engaged with leading characters at all times; instead, some of these more simply involved a series of related scenes, from the development of natural landscapes, to interactive scenes or setting.

Some participants provided more detailed, complex accounts of their imagined narratives than others. Occasionally, imagery experiences that pertained to narrative elements were expressed concisely and in a generic manner. Nonetheless, such concise narratives were included in this category, as long as they implied some kind of storyline or development, even when they lacked

detailed prose description. Brief narratives may also be experienced as part of a wider and varied imagery context, as emerged in some participants' annotations; however, concisely expressed narratives do not necessarily correspond to concise (in terms of duration) experiences of visual imagery. For instance, one participant provided a very succinct written account of his extended visual imagery experience (example below). The way the narrative content was described deviated from the overall 'guidelines' set for the *narrative* type; however, it was still possible to perceive the narrative elements involved as part of his imagery experience, also later confirmed in the face-to-face interview (a short transcription is also reported below). Therefore, its inclusion within the following visual imagery type was intended to capture the imagery's thematic content, in spite of the way this was expressed. Once again, this emphasises the study's need of a somewhat flexible coding framework, in order to capture more fully the thematic contents embedded in different participants' qualitative accounts of their imagery experiences.

Examples:

- Continuous narrative: 'Someone is investigating something but hiding from others, moving from pillar to pillar, door to door still hiding himself. Towards the end person enter[s] to the room which he wanted to reach but found nothing interesting, frustrated. This has [a] bit of horror sense' (Lucy; *Prokofiev*).

Figure 27 displays Lucy's continuous ratings, alongside additional details related to the unfolding of her visual imagery experience.³² In the case of this participant, imagery ratings stretched across the entire duration of the piece, matched by an imagery description which also entailed a continuous narrative.

- 'Interrupted' narrative: 'Monsters creeping around [the] bedroom. Become discovered + start to fight with birds. Thought about crocodiles waiting for and catching [a] prey in [the] loud stabbing sections. When pitch (tune) became high, the birds had won the fight' (Carlo; *Prokofiev*).

Carlo's continuous ratings are displayed in Figure 28. The interrupted narrative may be observed in the changes of imagery content, points which are also marked by changes in the continuous ratings of imagery (red line). This was not, however, always the case: other examples of interrupted narratives were not necessarily reflected by visible variations of the imagery ratings series.

- Concisely expressed narrative: 'This piece brought up visions of old silent movies, in particular a Victorian type tragedy with a villain and a trapped heroine' (Fredric; *Debussy*).

³² Information relating to what kind of imagery participants experienced at specific points of the music/graphed ratings was obtained from face-to-face interviews.

Despite the brief description, it is possible to notice the way a ‘Victorian type tragedy’ involving two characters implied a sort of narrative storyline—in addition, the participant’s continuous series also captured imagery ratings which arched across most of the musical work (Figure 29). The narrative aspect was confirmed in the face-to-face interview, where the participant elaborated further on his imagery experience: “*I kind of got this idea it was like a score (...) of this very melodramatic film that people used to watch in the 1920–30s... A lady being tied to railway tracks, and a villain trying to do horrible things; and then she manages to escape and get away with that. That’s kind of what came to me the second time [listening] as well. (...) That beginning part [opening bars of the piece] is what kind of brought the idea to mind of a silent movie, and this kind of idea of an unfolding drama*”.

- Series of related scenes: ‘Pencil [drawn] boy (“Little Prince”) look[s] like [he] is walking in a wind. Like in a body. Then he changes [into] a girl that is attending to some flowers and walking gracefully around a small garden’ (Julia; *Leginska*).

Whilst this example of narrative does not appear to follow a particularly logical sequence of events, the annotations nonetheless described a development that moved from the initial scene into the next, forming a short narrative sequence—with a peculiar twist.

- Interactive scene: ‘A pink animated rose which spins throughout the song (representing its life)—the rose loses its petals as the song goes on’ (Kate; *Debussy*).
- Natural landscape development: ‘This music helped me to (...) imagine a nice spring morning. Flowers are blooming. Butterflies are moving flower to flower. Birds are flying. Some water features and mountains. At the latter part some foggy cool feeling. Still I liked it’ (Lucy; *Leginska*).



Figure 27. Lucy’s continuous ratings for engagement (blue line) and visual imagery (red line) whilst listening to Prokofiev. The imagery annotations, combined with the imagery ratings series, capture an example of a continuous narrative.

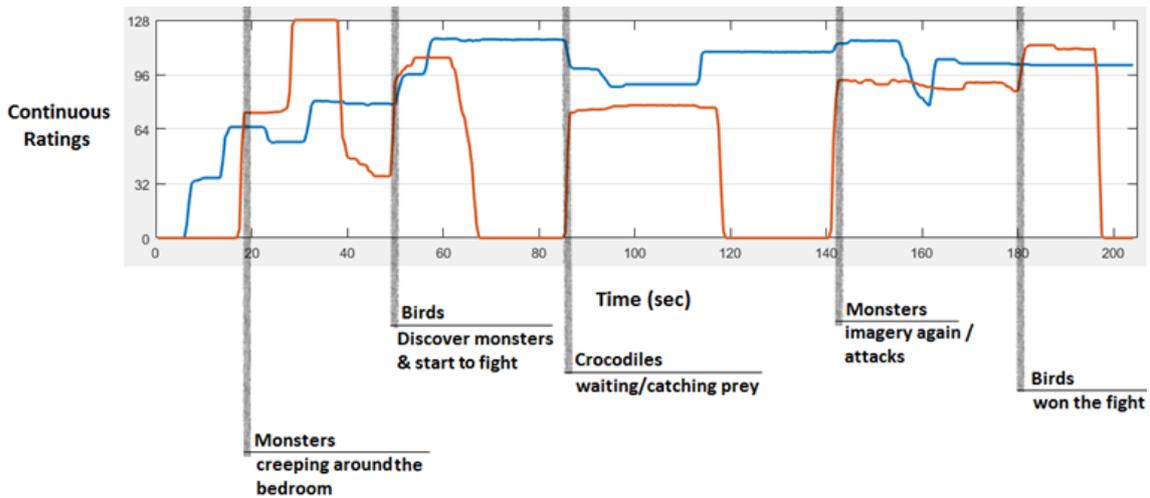


Figure 28. Carlo's continuous ratings for engagement (blue) and visual imagery (red) whilst listening to Prokofiev. Both the imagery ratings and annotations capture the interrupted narrative imagined.

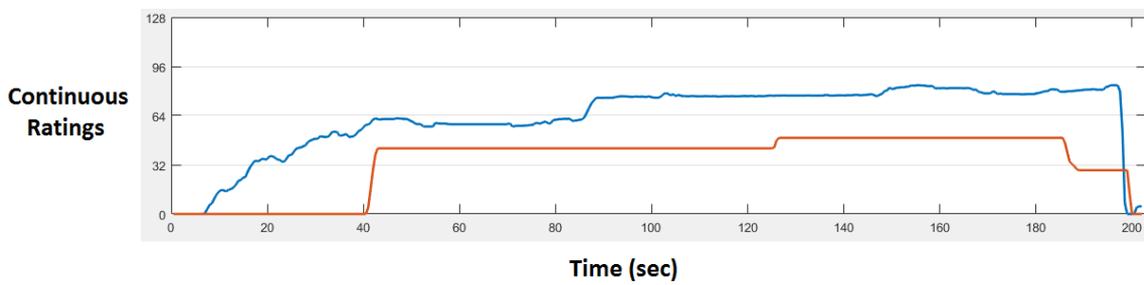


Figure 29. Fredric's continuous ratings for engagement (blue) and visual imagery (red) in response to Debussy. His imagery annotations concisely described a narrative; continuous ratings indicate that imagery was experienced for most of the piece's duration.

(7) Performance

Visual imagery type description. Visual imagery related to various aspects of a music performance setting. Perspectives of this imagery varied: these included the **performer's (first person) view** of his or her hands, the **audience's perspective** of the performance and **alternative performance settings**, such as a different selection of instruments (or instrumental combinations) than those used in the music being heard—for example, the view of a full orchestra performance instead of a piano solo recital.

Coding details. The following theme comprised visual imagery concerning music performance-related aspects. At times, the imagery reported involved close up views of the pianist's hands; in others, participants described imagining themselves as the performers, whilst observing from a first-person perspective their own rendition of the piece or focusing on their hands' movements. This imagery was not exclusive to pianists, but also occasionally emerged among participants who played a different instrument or no instrument at all, possibly highlighting the strong link between musical

perception and physical experiences.³³ Other participants widened their imagined performance perspectives to creative combinations of instruments, regardless of the fact that the music heard involved uniquely piano solo works. Interestingly, at times, participants provided highly detailed descriptions of these images, such as the performer's gender, the pianist's own thoughts, or whether the performance was intended to be public or private.

Examples:

- Performer's/first person view: 'I mostly imagined the musician playing it, and trying to play along to it myself (even though I don't play the piano!)' (Diego; *Rachmaninov*).
- 'The imagery I had was entirely made up of images of a pianist playing the piece (I'm a pianist, so I could imagine how it would be to play the piece)' (Ian; *Prokofiev*).
- Close-up view: 'A female pianist on stage. Close-ups of the hands' (Denise; *Debussy*).
- Audience perspective: 'I imagined watching the performer from the perspective of an audience member, but as if I were a voyeur watching someone perform to his or herself on a dimly lit stage, a performance not intended for an audience' (Oliver; *Leginska*).
- 'I imagined watching a pianist from the perspective of the audience, but I am somehow privy to the pianist's thoughts—s/he is remembering something from their childhood that I am seeing as a cartoon animation' (Oliver; *Rachmaninov*).
- Other Performances: 'An orchestra is playing, the room is full of audience' (Imogen; *Rachmaninov*).

(8) Personal Recollections

Visual imagery type description. Visual imagery comprising mental recalls of **personal experiences**, or encompassing aspects of personal, familiar contexts; examples may include imagery related to previously **experienced events**, **familiar places** or **familiar people**.

Coding details. The *personal recollections* visual imagery type was formed predominantly by imagery recollections of past events. As reported earlier in this thesis (Chapter 1), 'episodic memory' is also described in Juslin's BRECVEMA model as one of the processes whereby an emotion can be induced in a listener—also referred to as the 'Darling, they are playing our tune' phenomenon (Juslin, 2013:242). The way music can evoke personal memories is most likely to be a familiar experience for many music listeners. Yet, for some, such recollections may take the form of visual imagery, as

³³ More on music and embodiment may be found in Leman's (2008) work.

emerged in the current study. Juslin's work mostly scrutinises visual imagery and memory independently, although episodic memory is described as being mentally represented also via pictorial representation, among others (Ibid.:243); the possible overlap between the two processes, however, is not further discussed. Coding for the present imagery type did not only capture past experiences, but also included annotations involving specific places or people known to participants. At times, listeners did not specify whether the visual imagery described formed an imaginative recreation of familiar people/places/events, or if those images related to actual past experiences. The veracity of the memories giving rise to imagery was not considered within the *personal recollections* visual imagery type. Instead, the theme concerned the broader inclusion of memory-related information that emerged in participants' visual imagery. Hence, coding for this focused on annotations which explicitly expressed participants' (personal) familiarity with specific places or subjects, with the aim of capturing—even when only partially—elements of memory recollections within the visual imagery experience.

Examples:

- Recollection of a personal experience: 'The first sight (eye contact) with my favourite conductor when we played Bartók's *Concert [sic.] for Orchestra*' (Barbara; *Rachmaninov*).
- Familiar places: 'Cork City—a place I lived in' (Denise; *Leginska*).
- Familiar people: 'The imagery was about a trip with my daughter. I saw a beautiful view in "Czech Paradise"' (Barbara; *Leginska*).
- 'Event—when I page turned for the piece remembering the venue, performer + people involved with [the] masterclass' (Hector; *Prokofiev*).

(9) Pictorial Associations

Visual imagery type description. Mental images comprising overall '**relatively fixed**' **single scenes**, such as **landscapes**, **fixed subjects** or **objects** that emerged in music listeners' minds, often without further details concerning the way participants conjured up the imagery. As a result, the theme gathers types of visual imagery that were unrelated to any of the other visual imagery types. This broad category included pictorial associations to specific references, such as well-known **paintings**, **places**, **cinematic** and **literary** references, as well as to more idiosyncratic kinds of **pictorial imagery**.

Coding details. This visual imagery type principally encompassed straightforward descriptions of imagery that focused, overall, on single events or fixed perspectives of a scene/subject (as opposed to, for instance, a series of related incidents, as captured by the *narrative* visual imagery type). Annotations reporting these kinds of imagery varied from detailed descriptions of a particular scene,

to simple, straightforward mentions of the visual association made (examples below); in addition, among the latter kind, coding for this theme included imagery related to specific artworks, places, and literary or cinematic references.

As evident from the wide-ranging variety of data gathered, *pictorial associations* formed a particularly broad theme; thus, coding for this category should be further clarified. With regards to literary and cinematic references, one may argue the possible implication of a *narrative* imagery type if, for instance, listeners mentally traced the literary work's storyline during music listening. Whilst this could stand as a justifiable argument, the *pictorial associations* theme primarily included extremely reduced descriptions of imagery, often solely citing the literary reference in question. In these cases, such lack of detail did not enable a clear insight of the listener's imagery experience; nor an understanding of the extent to which narrative was involved (if at all).³⁴ Hence, unless otherwise stated by participants, basic literary or cinematic citations are included within the *pictorial associations'* coding. Similarly, it may also be argued that imagery relating to well-known, public places could emerge, instead, from a participant's memory recall. However, in the context of the present study, it was participants' explicit expression of personal links to the imagery's content, or aspects of it, that delineated the *personal recollections* visual imagery type—a strategy also intended to differentiate between imagery linked to remembered personal experiences and imagery that may have developed through general knowledge or other external sources of information.

As mentioned earlier, the *pictorial associations* imagery type differed from the others also in terms of its coding overlaps, since the theme captured imagery annotations that did not relate to any of the other visual imagery types.³⁵ From the opposing perspective, a more flexible approach to this theme could consider ways in which contents from other visual imagery types could relate to the notion of 'single events' or scenes, extending further the *pictorial associations'* coding. For instance, an imagery experience involving a brief view of the pianist on stage (part of the *performance* imagery type) may also be considered a 'single scene'. However, the *pictorial associations'* coding here reported was not based exclusively on the content of the imagery described, but was also intended to capture the immediacy (at least on an apparent level) of this imagery, and its 'unrelatedness' to the other visual imagery type—which appear more overtly attached, in a way or another, to specific aspects of one's personal/listening experience (as specified by the imagery type). At this point, it is important to emphasise that this visual imagery type does not by any means imply

³⁴ Unlike the concise narrative example previously described, straightforward citations do not point towards any potential narrative elements.

³⁵ *Arbitrary* may be considered an exception, since this is formed by an additional coding per se, as earlier explained.

an absolute exclusion of further, complex links between the image conjured up and specific aspects of the listener's experience; however, it was intended to capture their apparent immediacy, or 'simple emergence', based on participants' descriptions. In addition, confining *pictorial associations* to imagery which belongs exclusively to this imagery type not only avoids an excessive, conflicting overlaps of codes, but enables a clearer sense of the variety of the imagery which emerged, through a more clearly defined coverage proportion of each category (later reported).

Examples:

- Places: 'Scene of Paris in winter' (Carlo; *Rachmaninov*).
- 'Vienna' (Enzo; *Debussy*).
- Film references: 'A Matter of Life and Death (film)' (Enzo; *Prokofiev*).
- 'Scene in Tim Burton's rendition of *Alice in Wonderland* falling down the rabbit hole' (Hector; *Prokofiev*).
- 'Silent films' (Portia; *Rachmaninov*).
- Fixed objects or perspectives: 'Ship' (Florene; *Debussy*).
- 'A woman's face—beauty' (Hector; *Debussy*).
- 'A tiger in the jungle' (Denise; *Prokofiev*).
- Single scenes: 'Short image of a countryside scene and its winter' (Portia; *Leginska*).

4.2.2 Shared Musical Topics

As noted earlier, each visual imagery type has the potential to range from shared experiences to more idiosyncratic occurrences. For instance, different listeners may conjure up imagery contents related to similar emotions, while an individual might imagine a negative scene whilst listening to a positive, tonally major piece of music—as was the case, in this study, for Imogen whilst listening to Debussy; see Section 4.2.5). Whilst the present research will not investigate the shared or idiosyncratic extent of each visual imagery type, this section provides an overview of the shared musical topics that occurred in each piece. Table 12 displays a list of topics that emerged from participants' written annotations, per piece; it is possible to notice the way certain topics were more widely shared than others, ranging from as few as two participants, up to almost half of the sample (16 participants). For each topic, extracts from participants' written annotations are included; although this thesis does not allow enough space to fully review each topic, the brief discussion that follows intends to provide a sense of the possible ways in which certain topics emerged.

Table 12. Topics emerged from participants' visual imagery annotations. Details with regards to the piece, number of coded references/participants are provided, in addition to extracts from the written annotations.

Topic-related Imagery/ Theme	Piece	N. of References	N. of Participants	Examples (Extracts from participants' annotations)
Birds	Rachmaninov	3	3	- Birds singing a song in the trees (Hector). - Birds singing/chirping (Adam).
Chase	Prokofiev	17	16	- Black and white silent film where the police man chased the robber (Leo). - Keystone cops type policeman chasing them (Portia). - Crocodiles waiting for and catching prey in loud stabbing sections (Carlo). - Tom & Jerry, the cartoon characters chasing each other! (Kate).
Chase	Rachmaninov	2	2	- (...) ended up chasing the girl through cobbled streets (Leo). - A burglar with a sack trying to steal from a castle—he then gets caught by the villagers—and escapes again (Helena).
Dance	Debussy	10	10	- Started [off] with a couple dancing waltz (Margaret). - A couple dancing in a Parisian ballroom in the 1930's (Albert). - I imagined a grand ballroom (19 th century stereotype) in which the upper class dance to the opening strains (Oliver).
Dance	Rachmaninov	3	3	- In places, the sense of a rather rustic dance (Mark). - A duet ballet dance Romantic movements (Lucy). - A girl like Alice in Wonderland dancing/moving between stars like stepping stones (Leo).
Death	Leginska	4	4	- The small animal did not make it (Phoebe). - Old man in a park in Autumn, has just lost his wife and is lamenting (Carlo). - Images of funerals, commemorative services (Fredric).
De/escalation	Prokofiev	5	3	- Staircases (Enzo). - Stairs (Grace). - Rollercoaster ride—lack of control (Hector).
Evil/ Malevolent	Prokofiev	9	8	- A demon creeping on tip toes (Albert). - Monsters creeping around bedroom (Carlo). - Two thieves are trying to get into a house secretly (Imogen).
Horses	Debussy	3	3	- Horse trotting, dressage (Nicolai). - Horse imagery (...)—Austrian (Phoebe).
Horses/Heavy steps	Rachmaninov	5	4	- Men on horses. Like [cavalry] (Leo). - Footsteps of the giant/bear (Phoebe).

Industrial	Prokofiev	5	5	<ul style="list-style-type: none"> - You could hear how factories and people are working non-stop, the rhythm of factories (Florene). - The image of a busy city with people moving [hurryingly] on the streets (Imogen). - Quite detailed imagery of an old steam train, I think during the faster parts (Diego).
March	Rachmaninov	2	2	<ul style="list-style-type: none"> - People marching + banging a drum, marching band (Ian).
Rustic/Folk	Rachmaninov	3	3	<ul style="list-style-type: none"> - Folklore. Popular (Nigel). - A rather rustic dance (Mark).³⁶
Water	Debussy	8	7	<ul style="list-style-type: none"> - Waterfall (Hector). - Peaceful lake (Brenda). - Rain showers (Adam).
Water	Rachmaninov	5	4	<ul style="list-style-type: none"> - Surprisingly, some of the music had a 'sailing' feel and I visualized the sea (Albert). - Water. Sound of the waves (...) Playing with water (Brenda).

As outlined earlier, the identification of topics in this thesis stressed the aural association of the topical reference. The bird topic in Rachmaninov is one instance, most likely an association that emerged from the repeated perfect fifth intervals appearing both at the opening, as well as throughout the piece (Figure 30). At first glance, some of the topics listed above may strike the reader as being somewhat peculiar categories, or lacking an apparent affiliation to specific sounds; yet, for the reasons outlined below, these types of visual imagery also captured intriguing aspects that led to their inclusion in the *musical topics* category. For instance, the de/escalation topic: whilst this only emerged among three participants, the way the image of 'stairs' was emphasised (by two of these) was striking. Both participants provided drawings of this imagery (Figure 31): for Grace, this was the only imagery reported in the written annotations—also pointed out in the interview: “*Ah... a lot of stairs actually!*”; whilst for Enzo, among the various imagery described, only the 'stairs' image was additionally reported as a drawing. A possible explanation for this may be the way some aspects of the music (such as the heavy chromaticism in Prokofiev's work; or the way the thematic^m material is repeated whilst gradually rising or falling in pitch) gave rise to an idea of ascending or descending—via rollercoaster or stairs! 'Descending' is, in fact, also reported in Enzo's written annotations. In his interview, Enzo describes how there is “*lots of descending going on, isn't it... and made me think of staircases (...) [it] was like a spiral (...) like a spiral staircase*”; although, later in the interview, the sense of direction was unsure: “*if you get a spiral staircase, is it going up? Is it going*

³⁶ This imagery was coded under 'dance' as well as 'rustic/folk' topic.

down? It depends". In this respect, it may also be possible for these mental images to interweave with kinaesthetic imagery—although such aspects go beyond this thesis' aims.



Figure 30. Opening bars of Rachmaninov's *Etude-Tableaux* Op. 33 No. 4.

Debussy's waltz characteristics emerged in ten participants' visual imagery through dance-related imagery—some of which also specified 'the waltz'. The dance topic also emerged (in fewer instances) in Rachmaninov, which, however, included rather different styles of dances: in this case, it is likely to be the piece's rigorous rhythmic drive that led to the emergence of a dance topic. Similarly, the strong rhythms and heavy down beats, emphasised by the lower octaves (Figure 32), could have influenced the rustic/folk-related imagery in Rachmaninov—or, in the case of other listeners, a march topic.



Figure 31. Drawings from Grace's (left) and Enzo's (right) written annotations on their visual imagery, after listening to Prokofiev.



Figure 32. Bars 5–6, Rachmaninov.

Prokofiev's busy textures led to similarly busy scenes in some of the imagery reported—the industrial topic (in this, trains were also mentioned repeatedly); while the potential influence of media, such as film, on listeners' imagery responses (also briefly discussed later, Section 4.2.5) is

likely to have contributed to the chase and the evil/malevolent topics. Imagery of horses appeared rather elegantly in Debussy; by contrast, horse-related imagery in Rachmaninov tended to emphasise heavier movements or scenes (as a result, for the latter piece, this topic was merged with imagery linked to heavy footsteps—both possibly triggered, once again, by the accented, lower octaves). It was also interesting to notice contrasting mental images of water between the two pieces' responses: these were more frequent for Debussy—potentially a result of the high-pitched, flowing descending figures appearing throughout the piece (Figure 33); in Rachmaninov, however, the 'sailing feel' and 'sound of the waves' may have emerged, instead, by the occasional, broader rising and descending left hand figures (as in bar 29, Figure 34).



Figure 33. Bars 12–14, Debussy's *Valse Romantique*.



Figure 34. Rising and descending figure (left hand, from bar 29), Rachmaninov.

4.2.3 Drawn Annotations

The imagery examples presented in the previous section (4.2.1) provide a sense of the complexities contained within visual imagery responses, as well as their qualitative coding: this is due not only to the sophisticated, idiosyncratic aspects of the phenomenon, but also to the internalised nature of the imagery process and its reliance on participants' abilities to self-report these. This section provides a closer insight into more detailed examples of participants' responses.

A number of participants showed a preference for drawn annotations over prose text to describe their visual imagery.³⁷ A selection of these are presented below, alongside transcribed extracts from the face-to-face interviews: these not only provide clarifications on the content of their drawings (and visual imagery) below, but also offer an insight into the kinds of associations made, as well as the intricacies involved at times as part of the imagery process.

Debussy

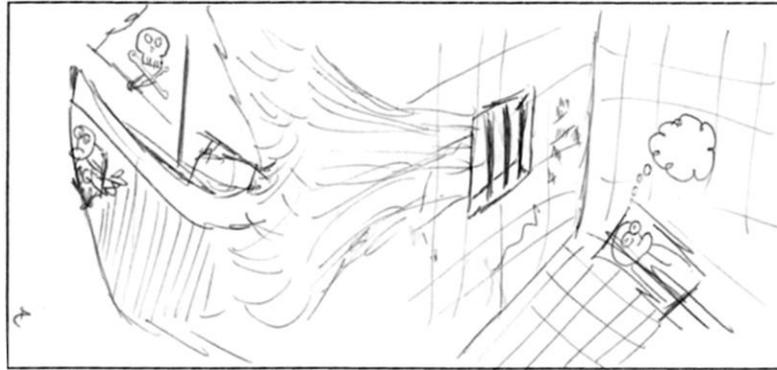


Figure 35. Quinn's imagery annotations after listening to *Debussy*.

As mentioned earlier in the previous section on *Shared Musical Topics* (4.2.2), participants' visual imagery whilst listening to Debussy frequently related to water. This was also the case for Quinn, a participant from the more musically experienced group. In particular, this emerged in relation to the falling arpeggiated figure, illustrated in Figure 36: “*Those bits within the music [bars 12–15], the kind of flurry rhythms... that... I kind of associate them with [the] motion of water*”. Quinn continues discussing the piece: “*...but there is still also something quite claustrophobic*”. As Quinn expands further on his overall imagery experience in the course of the piece, the idea of water and his perception of a ‘claustrophobic’ feeling emerged interwoven within the narrative of his imagery:

“...it was all part of some kind of prisoner's dream to be outside. He was kind of holed up on this prison on an island, like the Count of Monte Cristo, you know, that goes in prison and stuff (...), and there's something quite hopeful and very dreamy about this piece, I think... and those associations to water and the kind of waltziness about it, as well, how the water waves can carry you... but then it almost stops and he realises: yeah, I'm kinda holed up into this prison... but if I wasn't a prisoner, I'd be on the sea... I'd be a captain... or a pirate”.

³⁷ These were included as part of the thematic analysis—coding was informed by the interview discussions.



Figure 36. Debussy's *Valse Romantique*, bars 12–15.

Leginska

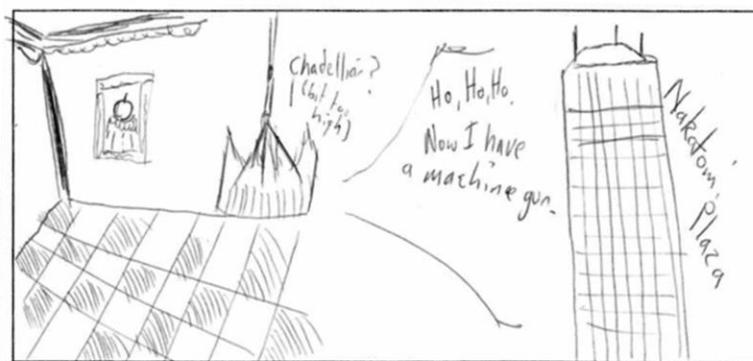


Figure 37. Quinn's imagery annotations after listening to Leginska.

In the Leginska, Quinn's visual imagery partly emerged from an association made with another piece of music and its context: *"it reminded me of another piece of music, basically. And that piece of music made the association to Nakatomi Plaza, which is from the film Die Hard. So I was thinking about Die Hard and entered this quote [cited above in Figure 37]"*. Contrastingly, the left side of Quinn's annotations links to a Baroque association (the Baroque theme also appears in Quinn's visual imagery during Rachmaninov's listening, as discussed later):

"When I think of that time period I think of really fancy houses, che[qu]ered floors, big rooms and portraits of the house master (...) and it's not quite right in terms of angling, 'cause it's... a bit skewed (...). There's a hauntedness about it because we're not actually there, you know. it's all in our heads. It's all in my head".

The visual imagery experienced by Gregory, also a participant from the more musically experienced group, appeared to be shaped closely in relation with the work's chromatic features (an example of this may be seen in Figure 39, the piece's opening bars,) and its musical structure. Gregory described conjuring up, whilst listening to Leginska a *"drunken lizard, 'cause there was a chromatic movement in the first bit (...), a sense of lazy, drunken, languid... yeah. And then the second section is much more sung. And nicer"*. The participant described the way his imagery—and annotations—were separated into two parts *"because there are two drawn sections to the piece"*. His imagery changed with these sections:

“This drunken lizard strolling about, and he comes across some other things. I couldn't see it definitely, but I knew there was something else there. I think he sorts of listens to that melody. And then he goes back... to being drunk [participant laughs]. So it was just a moment of release from this weird, surreal state of mind that the lizard's in”.

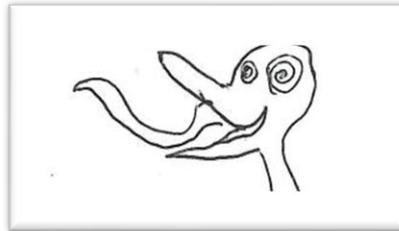


Figure 38. Extract from Gregory's imagery annotations after listening to Leginska.



Figure 39. Leginska's *Cradle Song*, bars 1–2.

Qiana (less musically experienced group), instead, experienced a different kind of imagery which was conjured up only towards the last third of the piece (Figure 40). Her imagery ratings were not particularly high, and she considered this particular piece as the least enjoyable and engaging out of the four. Nonetheless, Qiana provided a detailed account on the content of her rather brief imagery. Her perception of the music, quite different from the previous participant, involved a sense of effort that was reflected in the images described. It may be possible that the music's chromatic pattern, which gave rise to the 'drunk lizard' in the previous example, prompted, instead, the notion of circular movements in Qiana's imagery:

“The salmon, when they are gonna spawn... when they're gonna, you know, it's time to give babies essentially. They do a lot of circling in the water, right. Because their goal is to get up to where they were born (...). So salmon swim back, upriver, to get back to where they were born, to spawn. So they have to jump over, so they're going upriver... so it takes them a lot of effort to get there. But at first they're just swimming around (...), trying to figure out how to get upstream. So that's kinda what I felt, there were just a lot of fish in the waiting pool, kinda building up the energy to go upriver”

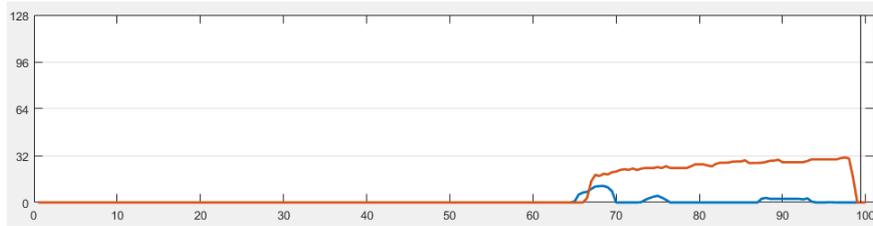


Figure 40. Qiana's continuous ratings for engagement (blue) and visual imagery (red) whilst listening to Leginska.

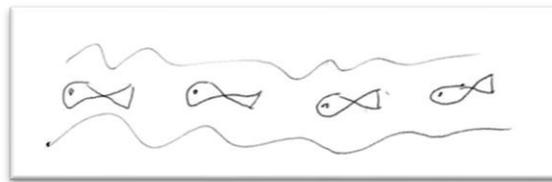


Figure 41. Qiana's imagery annotations after listening to Leginska.

Prokofiev

Gregory was one of the few more musically experienced participants to recognise a piece of music and recall its original title. According to the images Gregory visualised in Prokofiev (a section of his annotations may be seen in Figure 42), his knowledge of the extramusical associations tied to the musical work seem to have influenced the content of his imagery. Surprisingly, Gregory expressed that despite being the piece he least enjoyed, it was the one in which he experienced most imagery: *“the one I liked least, actually, the devil... diabolic piece. That was the most, obviously, visual piece”*. It may be possible that, perhaps, his assurance in being the ‘obvious’ piece to experience most visual imagery related to his knowledge of the work’s ‘intended’ extramusical association. His imagery, however, was not always clearly defined: *“generally, all the way through the piece I don't see like a story or linear things, it's just images, flashes, like a dream almost. You just see, like this... demon. But (...) it's not consistent”*. Further discussions on Gregory's broader listening experience for this piece also supported the notion that high musical engagement does not necessarily relate to strong liking or enjoyment; as earlier reported in Chapter 3, Gregory describes how the piece is *“engaging but in an irritating way”*. Most importantly, this statement strengthens further the potential engagement–visual imagery relation: regardless of the participant's dislike for the music, Gregory nonetheless experienced being engaged with the piece and conjured up images in his mind (see Figure 43 for his continuous responses).

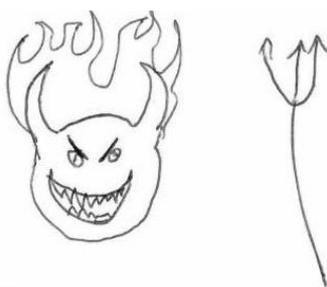


Figure 42. Extract from Gregory's imagery annotations after listening to Prokofiev.

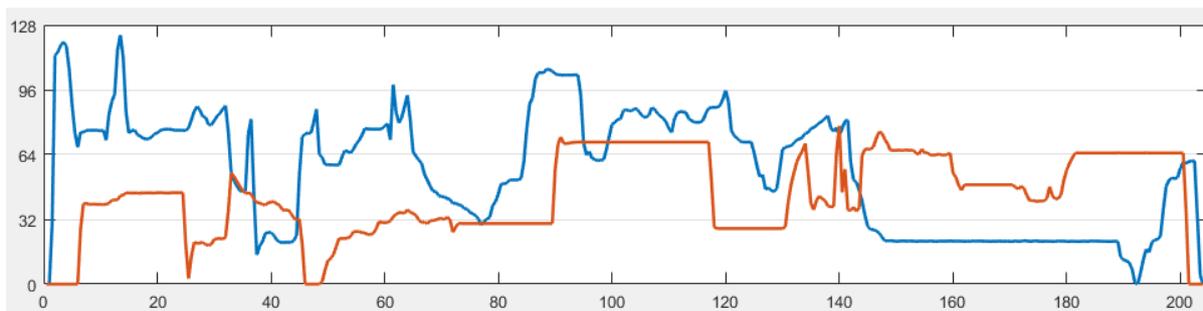


Figure 43. Gregory's continuous ratings for engagement (blue) and visual imagery (red) whilst listening to Prokofiev.

Unlike the imagery experienced in Leginska, Qiana imagined a continuous narrative that stretched throughout her entire listening to Prokofiev (Figure 44). She described how the imagery:

"...is like a silent movie. She's not in trouble, I mean, she's not, like, being attacked or anything like that, but this is the bad guy, right, with the moustache. And he's chasing her. When it starts out, she doesn't notice him, he's hiding behind trees. So they're in a forest. Then as the music picks up, she becomes aware that he's there. And he's following her. So it's kind of a chase scene (...) I don't know why. But it was all silent movie".

In addition to Qiana's experience, silent movies emerged in other six participants' imagery annotations (three from each more/less musically experienced groups). Four out of the six mentions related to Prokofiev, whilst the remaining two involved visual imagery in response to Debussy and Rachmaninov.

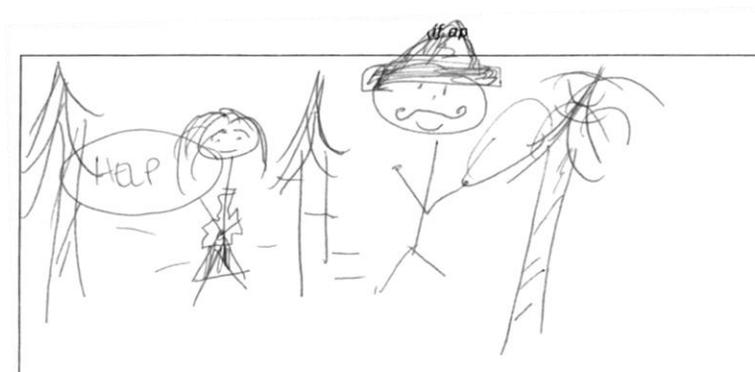


Figure 44. Qiana's imagery annotations after listening to Prokofiev.

Rachmaninov

Quinn's visual imagery experiences in response to Rachmaninov encountered, once again, a Baroque theme (illustrated in Figure 45). He describes:

"In terms of the imagery, I just got (...) images of a kind of Baroque chivalries, kind of Baroque landscape... there's a lot of green, a lot of men on horses fighting over who they're gonna marry, and they're gonna duel or something like that. So (...) that's meant to be a Baroque (...) neck dress [bottom left drawing]... something like Shakespeare would wear".



Figure 45. Quinn's visual imagery annotations after listening to Rachmaninov.

With regards to the abstract drawings on the right side of his annotations, Quinn provided two descriptions of what they represented. Firstly, he explained how these emerged as:

"A way to try and visualise the sound. (...) There's not a real kind of world-reference to it, like horses and all of that... one thing that struck me about that piece was just that... those gestures, those particular gestures. Especially the difference between... the contrast of like going from that da-da-da da-da-da (...) poom poom [participant sings the initial theme^m of the piece, bars 5–6, emphasizing the prolonged rhythm (dotted quavers) of the fifth bar; Figure 46]. That's like that... gestures... maybe short impulses... all of a sudden can go up to longer gestures".

Beside visualizing the musical material, Quinn's further discussions on the longer shapes, however, also refer to his listening experience in terms of engagement and visual imagery, drawing a link between the two:

"I think these represent the peaks in the engagement and the imagery, because there's a particular couple of chords that just appear, that really brought to life, I think, the peaks (...). It [the music] wasn't necessarily higher in terms of pitch, or anything like that, but it was like... just much more vivid in terms of what it was representing..."

This is particularly reflected in the participant's continuous engagement series, observable in Figure 46: increases in engagement ratings coincide with the start of the music's dotted quavers, both in its first as well as second appearance; imagery ratings also increase around the same initial passage of

the music, yet their peak takes place at a slightly later point. Whilst imagery ratings drop by the time of the second appearance of the dotted rhythm, both visual imagery and engagement increase with further returns of the theme^m, later in the music: this takes place after unit 60 in Figure 46, coinciding with a peak in both ratings; as well as just before unit 140, this time in a slightly varied version.

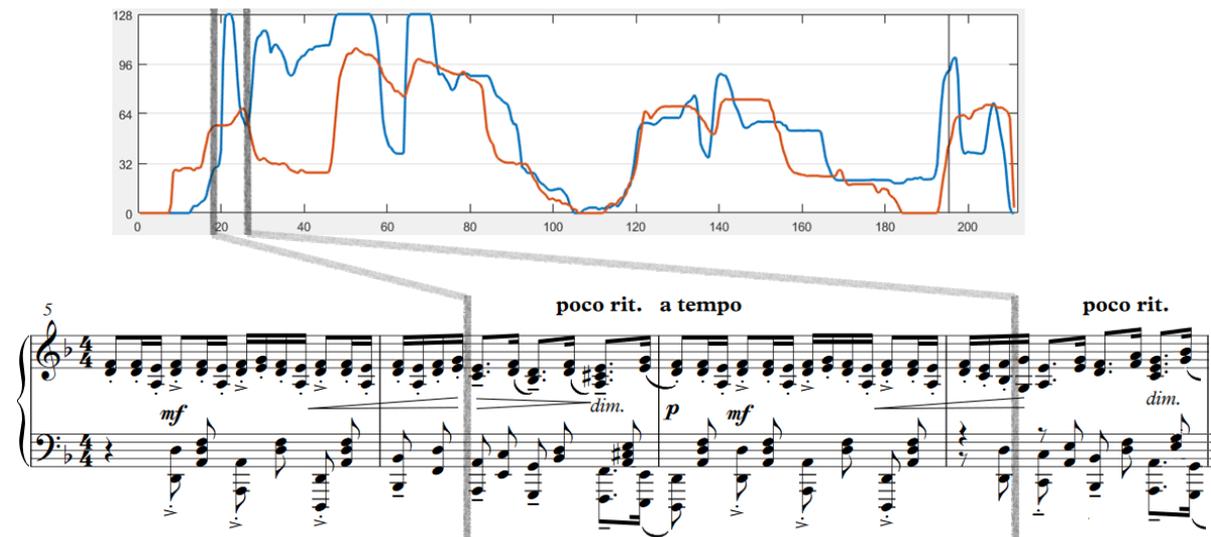


Figure 46. Top graph indicates Jack's continuous ratings for engagement (blue) and visual imagery (red) whilst listening to Rachmaninov's *Étude-Tableau* in D-Minor. Underneath, bars 5–8 of the piece.

4.2.4 Visual Imagery Types: Content Coverage

The following section provides an overview of each visual imagery type's content coverage across participants' imagery annotations. Content coverage for each visual imagery type was obtained through NVivo's Matrix Coding query, with percentages based on the number of words being coded. The figures presented below are not only intended to provide an indication of the imagery types' overall presence across the entire sample, but also the way their proportions varied in relation to the piece or participants' individual differences. It is important to note that the coding proportions reported below nonetheless emerge from qualitative sources, which rely on participants' ways of expressing their visual imagery; annotations varied from extremely detailed to extremely brief. Consequently, the figures or percentages provided are only an approximate indication of the overall coding presence. Nevertheless, they enable an insightful overview of which themes were more frequently present, as well as the way these proportions altered when different aspects were observed.

4.2.4.1 Overall Content

Table 13 displays the overall distribution of the nine visual imagery types with regards to the entire sample's annotations; coverage content for each category is displayed as a percentage.³⁸ In order to provide a broader overview of the coding involved, the table also specifies the number of references being coded. In the context of this study, percentages seemed to more suitably reflect the imagery type's thematic content coverage emerging from the annotations; however, the number of coded references could appear misleading—for instance, *pictorial associations* formed a small part of the data's overall coding; however, its sparse, brief annotations (typically involving single words per pictorial reference made) resulted in a relatively large number of individual references, regardless of its low coding coverage.

Table 13. Coding coverage of the nine visual imagery types for the sample's annotations. Each type's coverage proportion is displayed in percentages (based on word count), and number of coded references/cases.

Visual Imagery Type	Percentage	Number of Coded References	N. of participants
Arbitrary	2.47%	8	5
Emotions	12.91%	36	21
Material Abstraction	2.09%	12	10
Musical Topics	16.69%	77	29
Narratives	28.59%	40	20
Performance	17.37%	40	18
Personal Recollections	6.43%	21	11
Pictorial Associations	8.44%	48	20
Sound Associations	5.02%	14	9

In terms of coding percentages, the *narrative* imagery type was overall most present among participants' imagery annotations. This was followed by *performance* related imagery and *musical topics*, which shared similar coverage percentages; *emotions* immediately follow. The remaining visual imagery types form the remaining 24%; from the largest, these were *pictorial associations*, *personal recollections*, *sound associations*, *arbitrary* and *material abstraction*.

4.2.4.2 More and Less Musically Experienced

Overall, regarding the visual imagery types' proportions (where the sum of all imagery types' coding is considered 100%) for the entire group, the more and less musically experienced group share similar coverage, with only slight differences between the two. A comparison of the two groups may

³⁸ Proportions of each code were calculated through the 'column percentage' function, where the sum of percentages from the column totals 100%.

be observed in Figure 47: in both groups, the *narrative, performance, musical topics* and *emotions* imagery types cover the largest proportions of the overall coding. Yet, when looking at the number of participants coded (per group) in each visual imagery type (displayed in Table 14), it is interesting to notice that double the number of listeners from the more musically experienced group reported the *emotions* type of visual imagery (although content coverage was slightly higher for the less musically experienced group, as observable in Figure 47). *Material abstraction* was more orientated towards the more musically experienced group's imagery, supported by both the overall coding percentages and the number of participants reporting the imagery.

Table 14. N. of participants coded for each visual imagery type across the sample.

Visual Imagery Type	More Musically Experienced (N. of participants)	Less Musically Experienced (N. of participants)
Arbitrary	4	1
Emotions	14	7
Material Abstraction	7	3
Musical Topics	13	16
Narratives	10	10
Performance	7	11
Personal Recollections	7	4
Pictorial Associations	10	10
Sound Associations	5	4

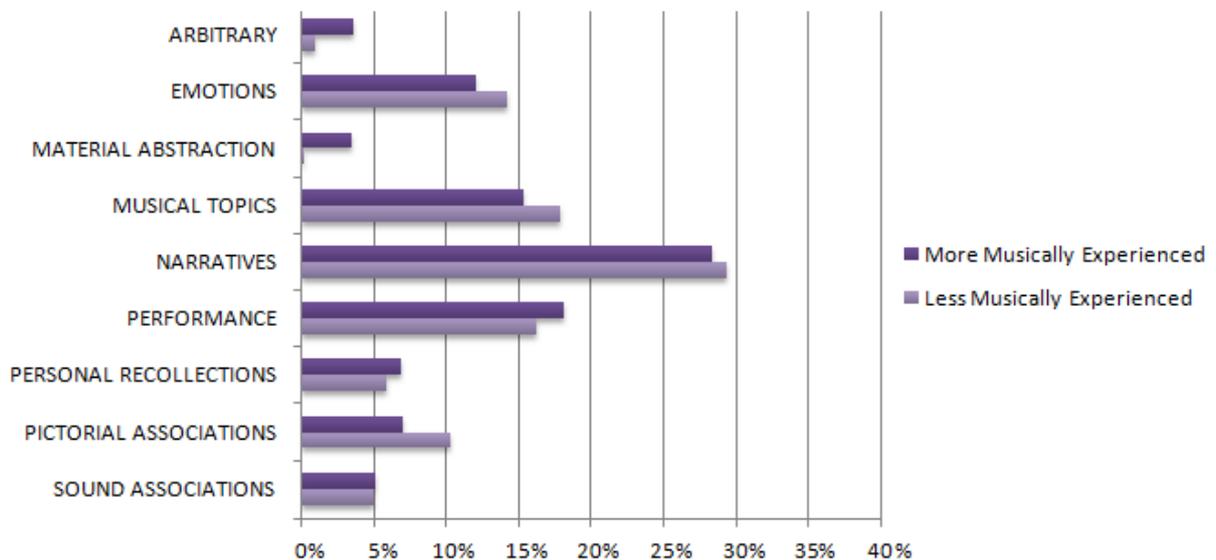


Figure 47. Bar chart displaying coding coverage (percentages) of the visual imagery types for the more and less musically experienced groups' annotations.

Observing code coverage from a slightly different approach, it is possible to notice further differences between the more and less musically experienced groups' annotations. Table 15 displays the spread (in percentages) of each visual imagery type's content coverage, this time with respect to

its distribution across the more and less musically experienced groups (hence, the sum of each row's percentages totals 100%). This viewpoint enables a general notion of how much content of each imagery type falls in each of the two musical experience groups—whilst still bearing in mind, however, that the way participants described their imagery, such as involving more or less extensive descriptions, influences the figures reported.

With the exception of *pictorial associations*, a visual imagery type marginally more present amongst the less musically experienced participants' annotations (by 2.68%), all remaining imagery types appear with greater content coverage in the more musically experienced group's visual imagery descriptions. It may be possible that such results reflect a greater ability by the group in expressing the imagery experienced, reporting more detailed descriptions; alternatively, linking back to the quantitative data earlier reported (Chapter 3), this may also be the effect of overall greater visual imagery being reported by the more musically experienced participants group than the other. *Pictorial associations*, *musical topics* and *emotions* appeared as the most equally distributed visual imagery types between the two groups, with coverage percentages maintained between 45-55% in each group. In contrast, once again, *material abstraction* entailed the most dramatic contrast of all imagery categories, with 96.39% of the code being present for the more musically experienced group. This reflects findings from Tan & Kelly's (2004) study: when listeners were asked to visually represent musical extracts, musically trained participants tended to present abstract shapes in their drawings, focusing on particular musical features; whereas pictorial representations and narratives were preferred by the less musically experienced. In the following study, however, visual imagery related to narratives was slightly more present for the more musically experienced instead (57.58%). Similarly, both *performance* and *personal recollections*-related visual imagery presented a slightly more marked weighting contrasts between the two groups. Finally, despite the particularly narrow range of imagery captured by the *arbitrary* type, more musically experienced participants seemed to experience more extravagant or seemingly unrelated imagery, accounting for almost 84% of the imagery type. A visual comparison of each imagery type between the two groups may be observed in Figure 48.

Table 15. Coding coverage for each of the nine visual imagery types across more and less musically experienced groups, where the sum of the two groups' imagery type coding accounts for 100% of its coding content.

Visual Imagery Type	More Musically Experienced	Less Musically Experienced
Arbitrary	83.67%	16.33%
Emotions	54.49%	45.51%
Material Abstraction	96.39%	3.61%
Musical Topics	53.47%	46.53%
Narratives	57.58%	42.42%
Performance	61.17%	38.83%
Personal Recollections	61.96%	38.04%
Pictorial Associations	48.66%	51.34%
Sound Associations	58.79%	41.21%

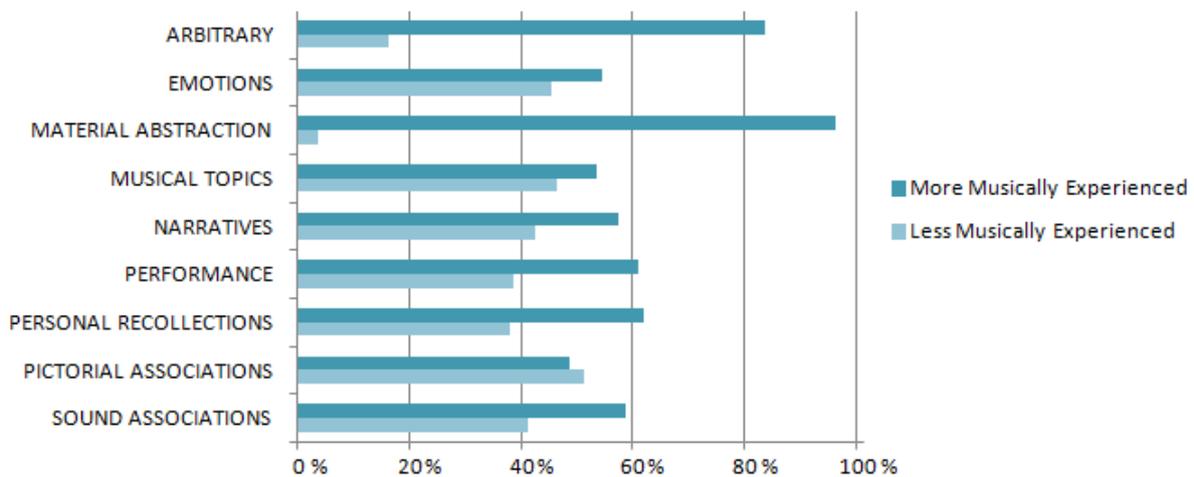


Figure 48. Distribution of each visual imagery type between more and less musically experienced groups.

4.2.4.3 Males and Females

The exploration of gender does not fall within the principal aims of this study. Nonetheless, a brief overview of the visual imagery types' coding coverage weighting between male and female³⁹ participants may be observed in Figure 49. Female participants appear to imagine more through *narrative* experiences (35% of female participants' overall imagery types coverage) than males (23%); instead, *pictorial associations* were more prominent among male participants (11%) than females (5%). The *emotions* imagery type also showed a marked contrast, with females' coding coverage (18%) representing around twice the relative proportion of male participants' *emotions* coding; however, when observing the number of participants reporting the *emotions* imagery type, numbers are very similar (10 males and 11 females). Nevertheless, further research in the field

³⁹ Note. The sample included a slightly greater number of male participants (n = 18) than females (n = 16).

would be required in order to verify whether differences in types of visual imagery experiences could be attributable to different gender groups.

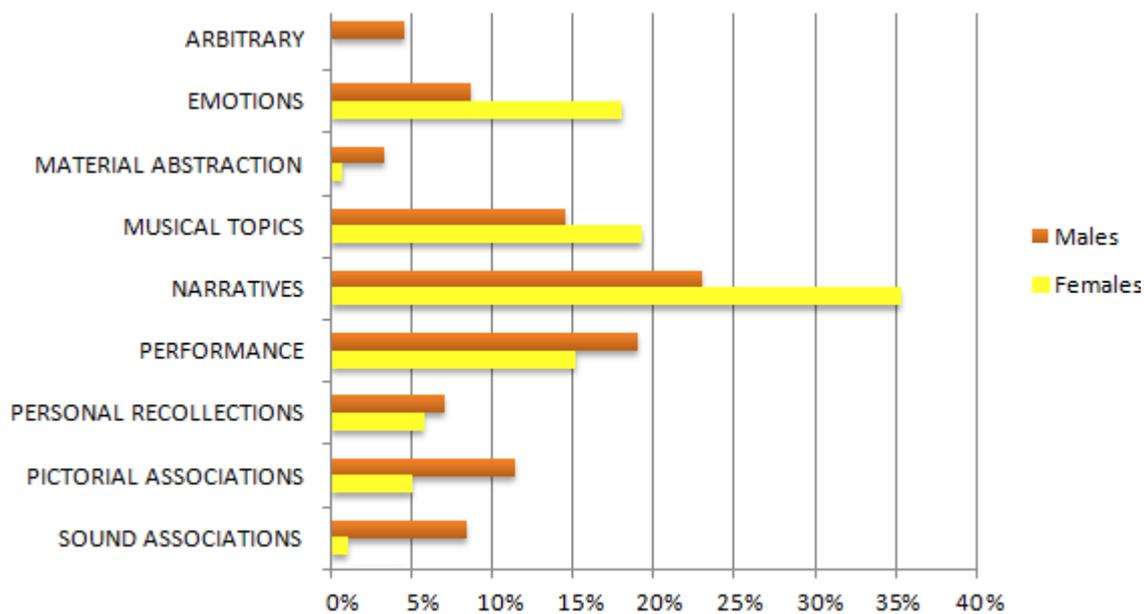


Figure 49. Bar chart displaying visual imagery types' coding coverage (percentages) across male and female participants.

4.2.4.4 Visual Imagery Types per Piece

Table 16 displays the distribution of coding coverage for each of the nine visual imagery types across each piece. The *arbitrary* imagery type was shared almost equally between responses to the Debussy and the Leginska, with slightly more presence in the former. As previously mentioned, Leginska is characterised by rather complex harmonies, soft dynamics maintained throughout and less conventional melodic patterns, with the exception of a short lyrical central section—the latter possibly being a distinction from the Prokofiev since, although strong dissonances frequently occur, the piece is characterised by the frequent reoccurrence of a particularly captivating theme^m. As a result, it may be possible that the ambiguous melodies and harmonies also resulted in the emergence of ambiguous visual imagery. Alternatively, it is worth considering that the Leginska was also the piece with overall lowest engagement ratings (see Chapter 3): perhaps an occasion for the less engaged mind to wander, and for visual imagery to surface as less ‘musically congruent’. Such observations, however, do not apply to the Debussy, which received higher engagement ratings—confirming the sporadic nature of the arbitrary imagery type.

The musical ambiguity in the Leginska may also contribute to the low percentages of musical *topics* and *sound associations* made—the lowest out of the four pieces in both imagery types. The shared *musical topics*, instead, were particularly present in the Prokofiev's imagery annotations (49.55% of

the code). As for other kinds of idiosyncratic *sound associations* made with the music, just over half of the coding was found in the Rachmaninov; this piece in particular seemed to suggest associations with other musical works or composers (Beethoven, Vaughan Williams, Yann Tiersen and Smetana among the ones mentioned), giving rise to the imagery associated to these works, their contexts or other related aspects.

The Rachmaninov and Debussy were the pieces which evoked most *narratives* in listeners' minds. This may be a result of the two works' aesthetic immediacy and a more clearly defined musical framework, forming a musical development perhaps easier to follow at first listening, both in terms of melodic linearity as well as structurally. Furthermore, the two works are characterised by recurring themes^m throughout the music, which, although at times transposed or altered on their reappearance, are nonetheless clearly recognizable—a recurring theme^m is also present in Prokofiev; the proportion of the *narrative* imagery type in this piece (25.13%) is only slightly lower than those in Debussy (27.25%) and Rachmaninov (29.37%). It may be possible that familiarization with a theme^m, alongside its returns and transformations, could be one of the elements encouraging the development of narratives during music listening—aspects also supported in Prior's (2013) work. With regards to Leginska, listeners only encountered on one occasion the return of the opening theme^m, after the central lyrical section; the piece, however, is also the shortest of the four—perhaps another factor to be considered in relation to narrative responses.

Interestingly, the largest proportions of the *emotions* coding (imagery descriptions interweaving with affective or emotions-related terminology) are present in Leginska and Prokofiev. The musical characters of the two works may be particularly suggestive of this: among participants' visual imagery annotations, the dramatic, negatively charged words such as 'fear', 'anger' and 'horror sense' for Prokofiev, conform with the relentless musical tension maintained in the piece; whilst the harmonic ambiguity in Leginska was also reflected in the *emotions* type's descriptions of the imagery, which varied from 'sad', 'sombre' and 'without much hope' to 'happy' or even 'passionate'. Frequently, though not exclusively, the more optimistic kinds of imagery occurred in the central lyrical section. An alternative perspective to this may be that listeners, when presented with more musically complex works, relate more easily to affective responses than other aspects of the music or their musical experience—particularly if the musical work presents complex qualities. In such cases, emotions could perhaps function in a similar manner to Landy's (2006) 'something to hold on factor'. Larger percentages of *emotions* for Prokofiev and Leginska may also be seen in Figure 50, which displays the individual pieces' distribution of visual imagery types.

Table 16. Coding distribution for each of the nine visual imagery types across pieces, where the sum of the four pieces' coding accounts for 100% of the imagery type.

Visual Imagery Type	Debussy	Leginska	Prokofiev	Rachmaninov	
Arbitrary	53.06%	46.94%	0%	0%	= 100%
Emotions	22.85%	28.13%	29.69%	19.34%	= 100%
Material Abstraction	25.3%	44.58%	24.1%	6.02%	= 100%
Musical Topics	19.03%	6.65%	49.55%	24.77%	= 100%
Narratives	27.25%	18.25%	25.13%	29.37%	= 100%
Performance	27.3%	20.15%	17.96%	34.6%	= 100%
Personal Recollections	34.12%	29.8%	18.04%	18.04%	= 100%
Pictorial Associations	22.36%	29%	32.02%	16.62%	= 100%
Sound Associations	15.58%	10.55%	23.62%	50.25%	= 100%

The *material abstraction* visual imagery type was also heavily Leginska-orientated, taking 44.58% of the code (although, on the whole, content coverage of this imagery type was less extensive compared to the others). Once again, ambiguity emerged in the imagery experience of one participant, which described 'some interesting colours and some strange colours as well'. Another listener's annotations reported a 'dark background'; whilst a further participant imagined 'a whitey peach background' with 'shapes and circles' during the central lyrical section. Finally, listeners reported greater imagery annotations relating to *personal recollections* whilst listening to Debussy than the other pieces; whilst *performance*-related imagery was oriented primarily towards Rachmaninov; and Prokofiev for most *pictorial associations* (32.02% of the code).

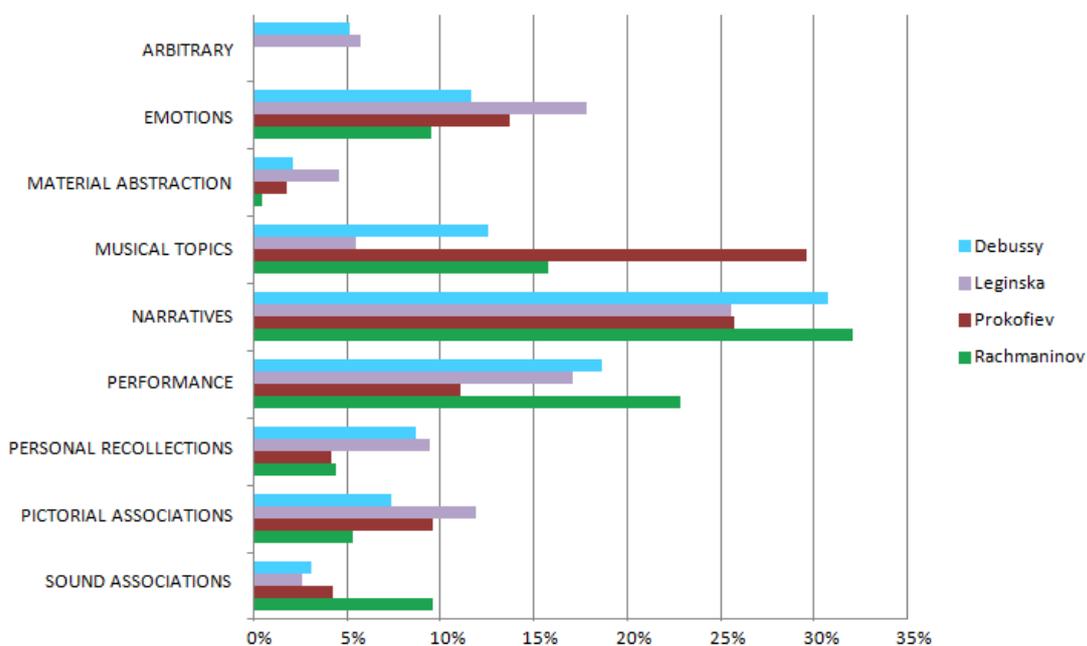


Figure 50. Bar chart displaying the visual imagery types' coding coverage (percentages) in each musical work (Debussy, Leginska, Prokofiev and Rachmaninov). The sum of imagery types in each work = 100%.

4.2.4.5 Coding Overlaps

The chord diagram⁴⁰ displayed in Figure 51 provides a visual overview of the overlapping contents across the various visual imagery types. As may be expected, the largest portion of overlapping text was found in the *narrative* imagery type (wider ribbons indicate a greater number of words being double coded), which was generally comprised of a greater variety and length of prose texts than other types. The largest amount of double coding in this overlapped with *musical topics* and *emotions*, as well as—to a smaller extent—*performance*.

Beside *narrative*, the *emotions* imagery type involved a particularly wide variety of overlapping imagery types, although on considerably smaller scales. A summary of the various overlapping visual imagery types in each category can be observed in Figure 51's outer stripes, where each colour proportionally represents the relevant overlapping imagery type (each imagery type's own colour is presented in the inner stripe: arbitrary = orange; material abstraction = red; musical topics = pink; sound associations = purple; personal recollections = blue; pictorial associations = turquoise; performance = aqua green; narratives = green; emotions = yellow/lime green⁴¹).

⁴⁰ Graph created with the use of Circos 0.68 (Krzywinski et al., 2009).

⁴¹ Please note, the nuance of the colour (yellow or lime green) may change with different computer screens.

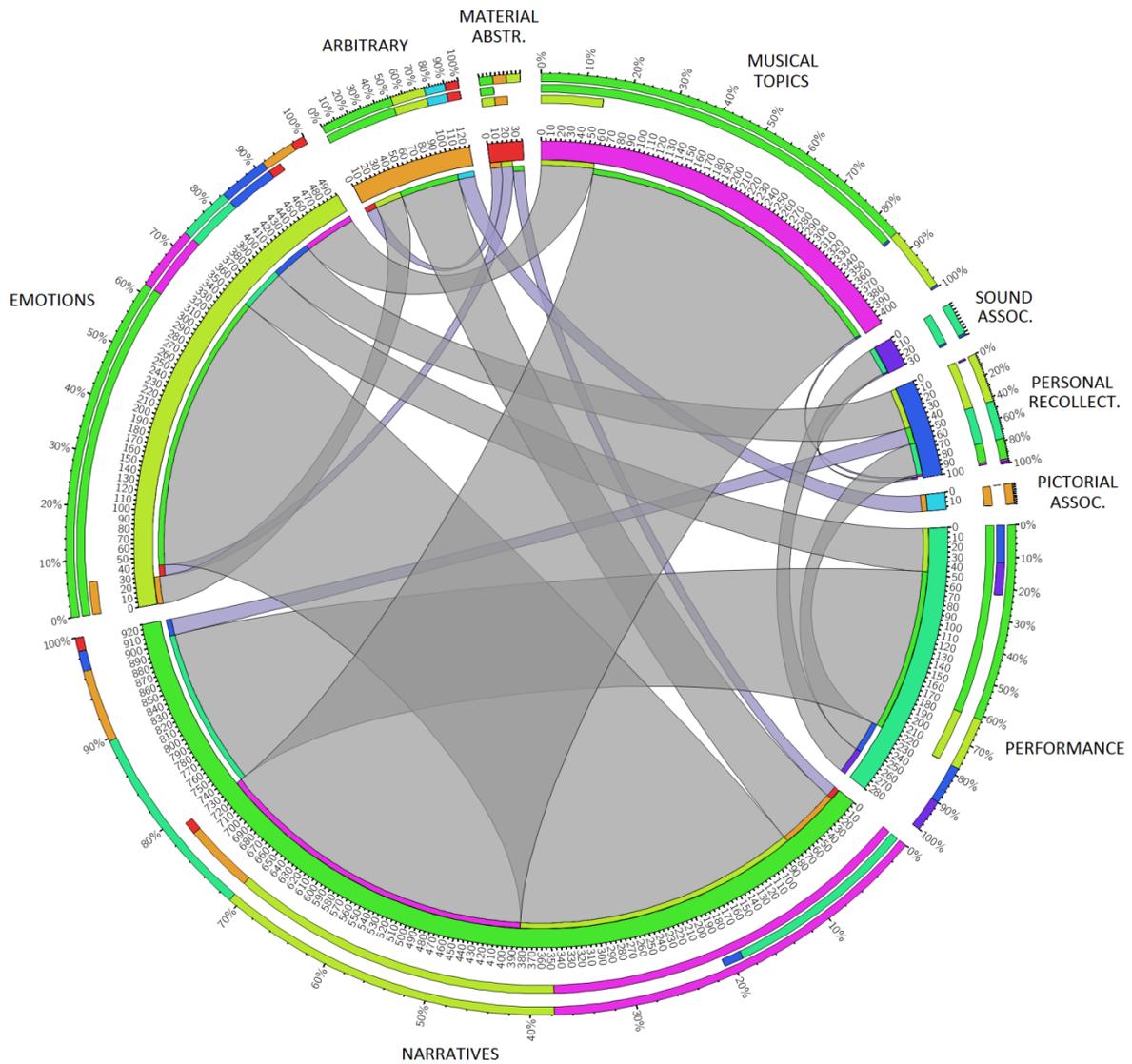


Figure 51. Chord diagram displaying overlapped coded content between visual imagery types.⁴² Width of connecting ribbons corresponds to the proportions of coding overlaps, based on word count. Outer straps indicate the relative proportions of overlapping categories for each segment (each colour refers to the relevant visual imagery type), in order of size (largest first).

4.2.5 On the Imagery Experience

Whilst participants were not asked to provide any further details on other aspects of their imagery experience in their annotations, other than reporting the mental images conjured up,⁴³ some interesting insights on additional aspects nonetheless emerged. The present section outlines facets of the visual imagery process that emerged from spontaneous descriptions provided by participants in their written annotation. This can enable a broader understanding of the multiple ways in which participants conjured up their visual imagery, as well as presenting additional material to stimulate further investigations of the imagery process itself.

⁴² As mentioned earlier, the *arbitrary* visual imagery type formed an additional coding to the other imagery types—hence its small overlap with *pictorial associations* (coding for the latter, beyond *arbitrary*, does not overlap with any other visual imagery type).

⁴³ See Chapter 3 for details on the experiment.

Four participants reported not experiencing any visual imagery during one of the four pieces: this involved Leginska on two occasions, once Rachmaninov, and once Debussy. A further participant described experiencing 'very weak imagery' whilst listening to Leginska, whilst for another Rachmaninov 'didn't evoke quite as strong imagery' as the other pieces. According to some annotations, it may be possible that some of the imagery experienced involved multimodal imagery, rather than exclusively focusing on the visual modality: for instance, some descriptions included words such as 'immense rising in a high church', 'swooping', 'descending' and 'spinning': whilst not explicitly specified, there may have been, nonetheless, possibilities for kinaesthetic elements to be part of these imagery experiences. Another participant wondered, alongside his imagery description of a pianist playing, 'how does the flow through the fingers feel?'

Unsurprisingly, some participants had difficulties in reporting an accurate description of the visual imagery experienced. At times, comments resorted to a general statement (such as 'lots of visualization'; or 'mixed images came into my mind'); whilst others expressed the difficulties involved in reporting the imagery experience ('memory flashbacks difficult to pick up'; 'nothing geometrically vivid but there was something there'). Furthermore, details on the way images withdrew from listeners' minds seemed to vary: whilst these 'faded at the end' for one participant, the 'image disappears quickly' was the experience for another.

On some occasions, participants explicitly described the effect certain musical feature had on their imagery experience; however, not all features were consistent with the imagery effect as described across different participants. These are reported below:

- **Loudness.** One participant described the way loudness in the music facilitated the experience of imagery: 'in all pieces, I noticed that the imagery became stronger (more vivid) when the music got louder' (Ian; Rachmaninov). On the contrary, another participant experienced the opposite effect: 'as the music got louder it tended to block these images' (Fredric; Rachmaninov), and '[visual imagery] became less pronounced' (Fredric; Debussy). A further participant specified how 'at the point of the chaotic arpeggios the imagery faded' (Nicolai), whilst listening to Debussy. Further investigations would be required to determine any possible effects of specific music features in the experience of visual imagery. In particular, whether the 'loudness' implied in the above examples, for instance, is intended solely in terms of dynamics, or whether textural intensity also plays a role. Finally, softer dynamics seemed to affect the speed of the imagery for one participant: 'rhythm of soldiers march is changing with some softer melodies' (Florene; Rachmaninov). Interestingly, if a slowing down in the music is visually translated to a change in rhythm, as described, this

slightly deviates from Eitan & Granot's (2006) findings of imagined bodily movements: according to that study, musical intensifications (on a single pitch) were speeding up, but diminuendos were strongly associated with spatial descents, rather than ascending slowing down.

- **Harmonies.** Few annotations described the way harmonic aspects of the piece directly influenced the imagery content. As earlier described, one participant referred to the way Leginska's 'odd harmonic progressions [led] to the image of a prison cell for the mentally ill, white walls, straight jacket' (Hector). As one may foresee, another participant associated major tonalities with a positive twist in the content of the imagery: in the 'section in major, begins to think about happy times together' (Carlo; Leginska). However, the major/happy association was not necessarily always the case: on one occasion, the sole imagery described by a participant whilst listening to the Debussy piece— which, despite a brief, minor central section, is the most 'optimistic' piece out of the four overall—involved a couple 'arguing with each other' (Imogen). One possibility to consider in relation to this response, perhaps, could be the influence of a different cultural background or listening habits (in this case, the participant's nationality was Vietnamese). However, once again, further research would be required to determine the possibility of cultural (or listening habits) influences on imagery experiences.
- **Performers and scores imagery.** Jasmine (more musically experienced group) described how simple musical passages emerged as an occasion to visualise the performer's hand movements, whilst listening to Leginska: 'a very short passage where I could see the pianist playing (it was a distinctive passage in the right hand, easy to follow the hand movement)'. The same participant, this time in response to Debussy, visualised, instead, the pianist playing 'during the prominent bass parts'. Another more musically experienced participant found repetition helpful to visualise 'images of the score, particularly when passages are repeated at pitch or transposed' (Nicolai).
- **Emotions, but less imagery.** Some participants experienced more visual imagery than others. Whilst a line of research, including the present research, increasingly supports the link between music-related emotions and visual imagery, there may, nonetheless, be exceptions to this. In one case, a participant described an affective focus in the listening experience, but less imagery: 'overall this created a positive feeling. A touch of happiness. However there were not much visuals' (Lucy; Debussy).
- **Mind Wandering.** As outlined in Chapter 2, visual imagery may also be experienced as part of the mind wandering phenomenon. Leo described how, whilst listening to Debussy, his

‘mind went for a wander’, followed by an imagery description seemingly unrelated to the music and coded as *arbitrary* by the researcher. This supports further the possible varieties of visual imagery experiences; such as the contextually unrelated imagery that may arise during mind wandering experiences, and the imagery that emerges as a result of a focused activity, as supported by this research—the imagery experienced whilst being *engaged* with the music.

- **Imagery in cinematic style.** Nowadays, most of one's daily life is likely to be heavily influenced by media such as film; interestingly, for some listeners, these influences also made their ways into their imagery experiences. For instance, participants' annotations at times described experiencing imagery in the style of an old silent movie. As mentioned earlier, seven participants (one participant experienced this twice) reported experiencing imagery related to ‘black and white (...) old time films’ (Leo), either with regard to their contents or the way mental images were visualised. At times, the music also served as accompanying soundtrack to the silent movie. Three further references mentioned the visualization (or association) of more modern movies, such as *A Matter of Life and Death* in Prokofiev, or images from *The Pianist* in Leginska.

4.3 Limitations

The thematic analysis conducted on imagery annotations made by participants whilst listening to solo piano works, gave rise to nine broad visual imagery types—nine ways in which listeners may experience visual imagery. It has been possible to see the complexities involved in coding such experiences; whilst these initial explorations contribute towards an understanding of the diverse, visual imagery responses among music listeners, the model is nonetheless open for further refinement through new empirical work. For instance, would similar visual imagery types emerge in response to different musical genres or styles? A major limitation of this study is the confined, stylistic choice of the musical stimuli which, arguably, particularly lend themselves towards the experience of visual imagery. The use of different musical styles is therefore an aspect worth exploring further: the extent to which this model would apply to Classical works, for instance, would serve as a step closer towards the validation of the model. Explorations of this model with regard to atonal music could also offer new insights—in particular, whether shared musical topics would still emerge. The present analysis focuses on participants' written annotations, although face-to-face interviews supported some of the responses provided. Future research may consider conducting the qualitative analysis on more in-depth interviews, allowing the nuances of these experiences to surface. Finally, this chapter presents the distribution of musical types across selected aspects (such as participants' musical experience).

Chapter 5. Empirical Study 2

The first empirical study, discussed in the previous two chapters, provided an insight into the broader research aims shaping this thesis. These were to assess whether there is a relationship between visual imagery and real-time engagement with music; and to empirically investigate visual imagery when listening to music through both quantitative and qualitative exploration. A time series analysis revealed a statistically significant association between engagement and visual imagery; such responses were also explored in relation to participants' (selected) individual differences (Chapter 3). A qualitative investigation of imagery annotations among participants yielded nine broad *visual imagery types* (Chapter 4). To validate these findings, Chapter 5 presents a replication (Simons, 2014) of the previous study with an additional parameter and aim: to observe listeners' use of programmatic ('extramusical') information and its possible influence on engagement and visual imagery. The audio stimuli for the experiment consisted of three movements from Rachmaninov's Suite No. 1 *Fantaisie-Tableaux* for two pianos, each comprising a programmatic title and an accompanying epigraph (further details are provided in Section 5.2). The inclusion of both programmatic and programme-free listening conditions facilitated a comparison of responses between these two groups.

5.1 Aims

In addition to the three aims set in the previous empirical study (Section 3.1), the present study also investigated the possible influence of programmatic⁴⁴ information—the original titles and accompanying poems of the selected pieces—on engagement and visual imagery responses.

The hypotheses were derived from the discussions in earlier chapters as well as the findings of the first empirical study. All aims and expected findings are presented here, for clarity.

- Aim 1: To investigate whether links are present between engagement and visual imagery continuous responses during music listening.

Hypothesis 1: It was predicted that continuous ratings of visual imagery would be positively associated with engagement, as they were in Study 1.

⁴⁴ In the context of the present study, the term 'programmatic' refers to the presence of extramusical descriptions (or elements) in the music listening tasks (that is, in this case, the works' titles and accompanying poems) as opposed to the notion of a narrative storyline.

- Aim 2: To explore a selection of participants' individual differences in relation to engagement and visual imagery responses.

Hypothesis 2: Engagement and visual imagery responses in the previous study were higher for the more musically experienced group; this difference, was, however, only statistically significant for ratings of engagement, possibly due to the large variation in visual imagery responses across the sample. Similar results were expected in the present study.

- Aim 3: To explore the content and nature of visual imagery and engagement responses through the collection of qualitative data (obtained through written annotations and face-to-face interviews).

Expected findings: The same visual imagery types were expected to emerge from the data, providing validation of the visual imagery types that emerged in Study 1 through replication. This did not exclude the possibility of new imagery types emerging, particularly as the study involves different musical stimuli and a new pool of participants. The thematic analysis conducted in Study 1 revealed a strong tendency for more musically experienced participants to report imagery related to *material abstraction*. Similar findings were expected for this imagery type, as musically trained participants seem to engage more frequently in abstract ways of representing music (Tan & Kelly, 2004).

- Aim 4: To investigate the possible influence of programmatic information—the original titles and accompanying poems of the selected pieces—on engagement and visual imagery responses.

Expected findings: The inclusion of programmatic details was expected to influence the mental images conjured up by participants. Chapter 2 discussed the way extramusical information can influence listening experiences; for instance, such information may manipulate the content of imagery (Vuoskoski & Eerola, 2013), provide a 'something to hold on factor' (Landy, 2006) or offer a basic orientation to the musical work (Meyer, 1956).

5.2 Method

5.2.1 Design

The experimental design for this study replicated the first study's design (see Section 3.2.1), yet with the addition of a further variable: the inclusion of the works' programmatic information. In order to explore the study's Aim 4, participants were equally divided into a 'programmatic listening' and a 'free listening' condition.

5.2.2 Participants

This study was advertised through email and on posters, both within the University of Hull and externally, and the incentive comprised a prize draw for one of two £15 Amazon vouchers. The study received ethical approval from the School of Drama, Music, and Screen Ethics Committee of the University of Hull on July 25, 2017. Participants provided written informed consent to participate voluntarily in the study and were guaranteed anonymity in any report or presentation of the data collected. Participants were recruited from those responding to these advertisements. No prerequisites were necessary for participation; individuals who took part in the previous study were not eligible to participate. Overall forty participants (18 females, 22 males) were recruited. Their ages ranged from 18–59 years with a mean age of 32.28 (SD = 12.72). The majority were in higher education (72.50%); with the remainder currently in full-time education (17.50%) or part-time employment (10%). Nine subjects had completed a postgraduate degree; eleven had attained an undergraduate degree or professional qualification; five had attained A-levels; and fifteen participants did not specify their highest qualification yet reported being currently in education. A large number were British (27 participants, 67.50% of the sample); two did not specify their nationalities; and the remaining eleven were American, British/French, Chinese, French, German, Hungarian, Iranian, Irish, Lebanese, Saudi Arabian, and Turkish. As in Study 1, the more musically experienced group was formed using the top 50% of (ranked) scores from the Gold-MSI *Musical Training* battery (Müllensiefen et al., 2014); the less musically experienced group were formed using scores from the bottom half. Once again, these categories were created to investigate the possible effects of formal music training and musical expertise on responses, as well as maintain consistency with the previous study and facilitate a comparison of findings.⁴⁵ Table 17 displays additional demographic information for each group.

Table 17. Demographic details for the more/less musically experienced groups in Study 2.

	More musically experienced	Less musically experienced
Age	M = 27.20, SD = 10.07	M = 37.35, SD = 13.29
Sex	9 Females 11 Males	9 Females 11 Males
Gold-MSI <i>Musical Training</i> Scores	Mdn = 40.50 (Range: 33–46)	Mdn = 15.50 (Range: 7–31)

⁴⁵ Median scores for the two groups were very similar, with +1.5 for the more musically experienced and -1.5 for the less musically experienced group.

One participant identified himself as having colour synaesthesia; consequently, continuous visual imagery ratings for this participant were particularly high. As noted in Section 2.3.1, some scholars propose a fine distinction between synaesthetic experiences and cross-modal mental imagery in terms of consciousness and specificity. For instance, Deroy and Spence (2016) argue that manifestations of synaesthesia generally appear as ‘specific, systematic, and involuntary’; while cross-modal correspondences guided by visual imagery ‘might then lead to more or less frequent, more or less specific, and more or less voluntary manifestations’ (p. 55). For the participant in this study, the visual imagery described for each piece was not limited to colours and was richly varied in content; his experiences therefore extended beyond what Deroy and Spence consider to be exclusively synaesthesia-related imagery and included a diverse range of images that emerged when listening to music. Therefore, his responses were retained as part of the sample.

Participants were divided equally into two listening conditions: ‘programmatic listening’; and ‘free listening’. In the ‘programmatic listening’ condition, participants were asked to read the titles of works and poems before they first heard each new piece. The information was presented once, on a piece of paper, and then removed after reading. In the ‘free listening’ condition, no information on the pieces was provided. According to Harrison (2005), cited poems tend to convey the emotional tone of the music, rather than being specifically programmatic (p. 52)—a consideration perhaps intended for the lack of a conventional narrative structure. However, as mentioned earlier, the term ‘programmatic’ refers more broadly to the inclusion of explicit extramusical concepts that can be musically conveyed or represented ‘without resort to sung words’ (Scruton, 2001b, p. 396). Table 18 presents a reference guide to the listening conditions along with further selected details to contextualise the qualitative responses discussed later. To preserve anonymity, each participant was randomly assigned a pseudonym.

Table 18. Pseudonyms, age, group details, and conditions for participants in the listening tasks.

N.	Anonymous ID	Age	More / less musically experienced	Synaesthesia	Details of the works provided?
1	Antonio	34	More	N	Y
2	Bethany	19	More	N	Y
3	Carmen	19	More	N	N
4	Daniel	18	More	N	N
5	Elsie	20	More	N	Y
6	Fiona	21	More	N	Y
7	George	20	More	N	N
8	Hannah	20	More	N	N
9	Isaac	23	More	N	Y
10	James	23	More	N	Y
11	Kameron	27	More	N	N
12	Luke	38	More	N	N
13	Marie	23	More	N	Y
14	Nick	23	More	N	Y
15	Orlando	36	More	N	N
16	Paula	54	More	N	N
17	Querida	45	More	N	Y
18	Rosie	19	More	N	Y
19	Sebastian	37	More	N	N
20	Thomas	25	More	N	N
21	Arthur	43	Less	Y	Y
22	Beatrice	23	Less	N	Y
23	Chloe	33	Less	N	N
24	Diana	23	Less	N	N
25	Eric	45	Less	N	Y
26	Fabio	26	Less	N	Y
27	Gabriel	30	Less	N	N
28	Hailey	24	Less	N	N
29	Igor	33	Less	N	Y
30	John	28	Less	N	Y
31	Ken	59	Less	N	N
32	Laura	57	Less	N	N
33	Mathias	30	Less	N	Y
34	Nathan	23	Less	N	Y
35	Ola	22	Less	N	N
36	Pamela	36	Less	N	N
37	Qasim	50	Less	N	Y
38	Rebecca	58	Less	N	Y
39	Sophie	52	Less	N	N
40	Teo	52	Less	N	N

Note. More = More musically experienced, Less = Less musically experienced; Y = Yes, N = No.

5.2.3 Materials and Equipment

The audio stimuli utilised for the study consisted of three complete Western works for two pianos, selected from Rachmaninov's Suite No. 1 *Fantaisie-Tableaux*, Op. 5. Unlike the first study, all three pieces were written by a single composer and originally comprised part of a four-movement suite. The first movement, the largest, was considered too long for the purposes of this study and was therefore not included; additionally, the remaining movements provided greater variation in terms of musical character. The overall selection of the works was based primarily on the availability of explicit extramusical references underpinning each piece; these are captured in the titles of the works and accompanying epigraphs, which cite extracts of poems by Byron, Tioutchef, and Khomyakof (as well as Lermontov, in the movement omitted from this study). Rachmaninov himself described the pieces as 'consisting of a series of musical pictures' (Threlfall & Norris, 1982:45). In this respect, for some listeners, aspects of the poems could be perceived as also emerging through the musical material, such as trills and *acciaccature* suggesting bird calls throughout the first movement.

Despite the overall stylistic approach, the three works selected are of a contrasting musical character⁴⁶. For instance, *La Nuit... L'Amour* (No.2, 'Night... Love'), in D major, is dominated by an overall optimistic character and specific romantic qualities, with rich textures, intense *amoroso* climaxes, and lyrical melodies with elaborate accompaniments. By contrast, the G minor movement, *Les Larmes* ('Tears', No. 3), has a more sorrowful character; the piece is characterised by greater dynamic contrasts than the previous movement, ranging from *ppp* passages to intensified build-ups in the central section. The funeral bells of St. Sophia's Cathedral in Novgorod are thought to be the source of inspiration for this work (Harrison, 2005:53). The concept of bells also emerges, with greater prominence, in the final movement *Pâques* (No.4, 'Easter'), both in the musical material and its related poem. Bells may be perceived from the vigorous rhythmic patterns that arise throughout the piece; and the 'Easter' theme is further emphasised by chord sequences referencing the Orthodox chant 'Christ is risen' (Ibid.). A translation of the epigraphs for each of three pieces' is provided below.⁴⁷ To facilitate discussion, future in-text citations of *La Nuit... L'Amour* will be abbreviated to *La Nuit*.

⁴⁶ With regard to the works' musical character, the first movement is arguably closely associated with the second—a further aspect in favour of its omission from the study.

⁴⁷ Translations extracted from the following edition of the score: Rachmaninov, S. (Composer). (1979). *Fantaisie (Tableaux), Op. 5*. [Sheet music]. London: Boosey & Hawkes.

No.2 *La Nuit... L'Amour*

It is the hour when from the boughs
The nightingale's high note is heard;
It is the hour when lovers' vows
Seem sweet in every whisper'd word;
And gentle winds, and waters near,
Make music to the lonely ear.

Byron

No.3 *Les Larmes*

Human tears, O human tears!
You flow both early and late —
You flow unknown, you flow unseen
Inexhaustible, innumerable, —
You flow like torrents of rain
In the depths of an autumn night.

Tyutchev

No.4 *Pâques*

The mighty peal rang out over the earth,
And all the air, moaning, shuddered and groaned.
Melodious, silver thunderings
Told the news of the holy triumph.

Khomyakov

The three pieces were performed by the researcher (Piano I) and a second pianist on a Steinway Model O and an 1885 Pleyel grand piano, recorded in a private studio space for the purposes of the experiment. Details of the timings of each recording are presented in Table 19; once again, three silent seconds precede the start of the music in each track. The experimental sessions took place in the same location used for the previous study and the same equipment and software were used to execute the listening tasks, capture the continuous ratings of participants, and audio record face-to-face interviews (for a detailed list of the equipment, please refer to Section 3.2.3 of this thesis).

Table 19. Details of the music pieces used as auditory stimuli for Study 2, selected from Rachmaninov's *Fantaisie-Tableaux*, Op. 5, for two pianos.

Composer	Piece	Date of Composition	Track Length
S. Rachmaninov	II. <i>La Nuit... L'Amour</i>	1893	6'23"
	III. <i>Les Larmes</i>		6'13"
	IV. <i>Pâques</i>		2'57"

5.2.4 Procedure

The experimental procedure replicated the steps undertaken in Study 1 (see Section 3.2.4 for a detailed overview); participants were thus instructed using the same information and definitions provided in the previous study. As before, following pre-experiment online questionnaires (*Goldsmiths Musical Sophistication Index* v1.0, Müllensiefen et al., 2014; and *Absorption in Music Scale*, Sandstrom & Russo, 2013), participants were asked to provide continuous ratings of engagement and visual imagery through the use of a slider whilst listening to the three pieces. The order of the listening task (visual imagery or engagement) was counterbalanced across the groups, whilst the sequence in which the three pieces were presented was randomised for each participant. After each listening task, participants completed brief questions on likeability and piece/genre familiarity using a 7-point Likert-type scale; whilst following the imagery listening task, participants were asked to provide free annotations on the content of their visual imagery (when experienced). However, unlike the previous experiment, half of the sample (20 participants) were assigned to the ‘programmatically listening’ condition: the title of the work and its poem were presented on a piece of paper prior to the start of the first listening task for each new piece. Participants were able to read the information at their own pace; the paper was then returned to the researcher before the start of the first listening task (this information was not presented again in the second set of listening tasks). No further information on the pieces was provided at any time for the ‘free listening’ condition (see Figure 52 for a visual example of the experimental procedure). Upon completion of the listening tasks, participants were asked to complete the *Spontaneous Use of Imagery Scale* (Reisberg, Pearson & Kosslyn, 2003). Finally, those wishing to proceed further took part in a brief face-to-face interview. The entire experimental procedure lasted approximately one hour.

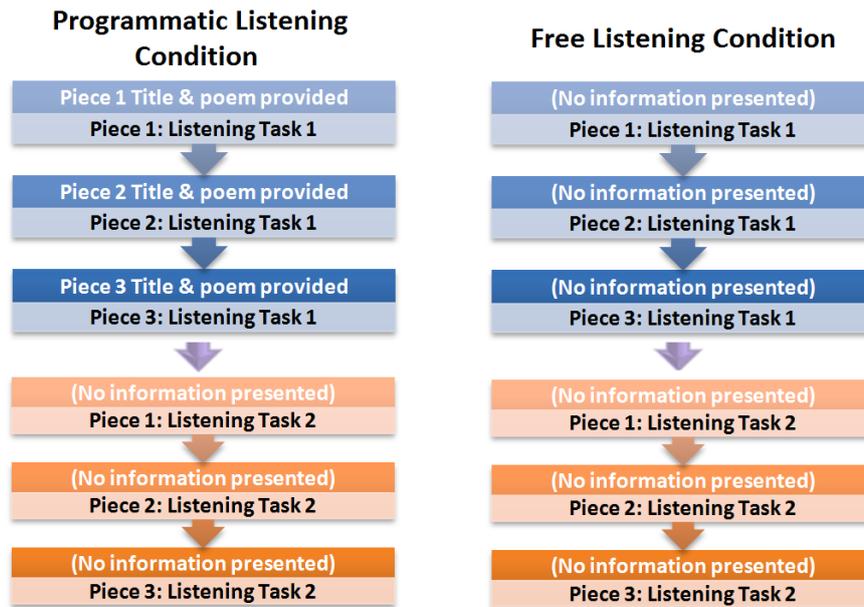


Figure 52. Experimental procedure for Study 2, showing the sequence of listening tasks (engagement or visual imagery); and information provided (title and poem) for each piece in the ‘programmatic listening’ condition (left).

5.2.5 Data Analysis

Once again, Study 1's data analysis process and techniques also applied to the present study. Participants' continuous engagement and visual imagery responses were analysed through the use of time series analysis (see Section 3.2.5 for further details); participants' (selected) individual differences were explored using correlation analysis and ANOVAs; whilst the qualitative data (participants' written annotations) collected was analysed through the use of thematic analysis.

5.3 Results

5.3.1 Examples of Response Context

Figures 53, 58, and 61 display mean engagement and visual imagery ratings for the entire sample, averaged every 0.5 second of each piece across the group. These grand series present an initial overview of the responses alongside the unfolding of the music, facilitating observations of salient moments of each piece regarding averaged ratings of engagement and visual imagery—such as instances of particularly strong (or weak) mean ratings. The following discussion provides a musical context for such moments, outlining how these coincide with particular features within the musical work. As before, the timings of responses and bar numbers are provided for informative purposes; these are, however, only an approximate indication of the averaged responses for the corresponding sample. The discussion nevertheless provides a closer insight into the musical work, highlighting

some of the possible links between certain musical features and the dynamic of the responses made by the group.

We observed how, in the first study, averaged imagery ratings seemed to build and peak, especially towards the central section of the pieces; this also seems to be the case for the graphs displayed below, albeit only marginally. However, the three pieces also seem to be characterised by multiple prominent peaks in their averaged ratings; this is particularly noticeable in visual imagery ratings for *Les Larmes*, Figure 58(a), or ratings of engagement in *Pâques*, Figure 61(a), which peak substantially towards the end of the piece. Graphs displaying separate mean series for more/less musically experienced groups (panels (b) and (c) of Figures 53, 58 and 61), yielded patterns that surprisingly contrasted with those in the previous study. Once again, more musically experienced participants rated higher overall levels of engagement; the visual imagery series for the two groups also showed considerable overlap and less dissimilarity in averaged ratings—notably in *Les Larmes*, Figure 58(c), and *Pâques*, Figure 61(c). This could indicate that possible divergences in imagery ratings between more and less musically experienced individuals may be particularly dependent on the style of the work heard.

5.3.1.1 La Nuit... L'Amour



Figure 53. Responses to Rachmaninov's *La Nuit... L'Amour*.

Panel (a) displays participants' overall mean **engagement** and **visual imagery** ratings (sampled every 0.5s) in response to *La Nuit... L'Amour*. The two lower panels compare responses from the more musically experienced and the less musically experienced groups for engagement (b) and visual imagery (c).

As shown in Figure 53(a), the highest point in the averaged engagement ratings for *La Nuit* occurs approximately halfway through the piece; between bars 63–64 in the music, marked in blue in Figure 54. Notably, whilst on a wider scale this falls within a climactic area of the piece, the highest point of the mean engagement series is reached during an intermediate section between the two climaxes: the increase towards the peak (Figure 53(a), blue line, starting around 170 seconds) commences with the rapid descending figure in the Piano II part (bar 60, Figure 54). By this point, the music had settled—albeit only slightly—from the first long, major *fff* climax of the piece. An underlying tension, however, persists: this is maintained by the rapid scalic figures of the second piano along with the return of the initial *adagio sostenuto* chordal theme^m (Piano I), this time at a faster, *agitato* pace. The engagement ratings start their descent in the following bar, a repetition of the musical material in the previous bar that subsequently leads into a second climax of a smaller scale and duration. Whilst this central peak is clearly visible in the averaged series, musical climaxes were not the only areas in this piece to attract higher engagement ratings. A further, considerable peak is also noticeable towards the end of the series (Figure 53(a), starting around 340 seconds). At this point, the musical textures are simplified to slow, rising chords (the peak in mean engagement is reached between bars 128–129, Figure 55), amid an overall calmer musical setting. Regarding *La Nuit*'s mean ratings of visual imagery, the highest peak also occurs in the central section of the work, yet at a slightly earlier point—approximately fifteen seconds of the peak of mean engagement (see Figure 53(a), circa 160 seconds). The peak here is reached towards the end of the first major climax, around bar 58 (Figure 56).

Interestingly, both averaged engagement and visual imagery series display a brief fall between 55–60 seconds, followed by an increase. These brief decreases occur between the end of the single, held note (F-sharp, bars 15–16) and the very start of the rising figures of Piano I (displayed in Figure 57) before increasing once again. Following the introduction of the piece—single notes in the first piano, responded to by slow sequences of rising, spread chords from piano II—this point presents the first deviation from the musical patterns presented to the listener. It is possible that, as a result of the fermata, the now longer pause created some kind of uncertainty for the listener (regarding where the music may be leading), hence the slight decrease in both responses. Alternatively, the single held note may simply not have been particularly engaging, as a result of which less imagery was experienced (or vice versa).

Whilst this may suggest the possibility of a response latency—the time taken for a participant to ‘retrieve, form, and report an answer’ (Monson, 2008:753)—the discussion is nonetheless based on mean responses averaged across the entire sample. Thus, although response latencies are not

excluded, individuals' abilities to report their engagement or visual imagery are also likely to vary. Therefore, such discussion highlights particularly high or low responses from the overall group.

Figure 54. Bars 60–66 of *La Nuit*; the top blue line provides an approximation of the highest peak in averaged (mean) engagement ratings across the group.

Figure 55. Bars 125–130 of *La Nuit*; the top blue line provides an approximation of a peak in averaged (mean) engagement ratings across the group.

Figure 56. Bars 55–59 of *La Nuit*; the top orange line provides an approximation of the highest peak in averaged (mean) visual imagery ratings across the group.

Figure 57. Bars 14–16 of *La Nuit*; averaged (mean) ratings for engagement and visual imagery across the group both exhibited a brief fall around bar 15.

5.3.1.2 *Les Larmes*

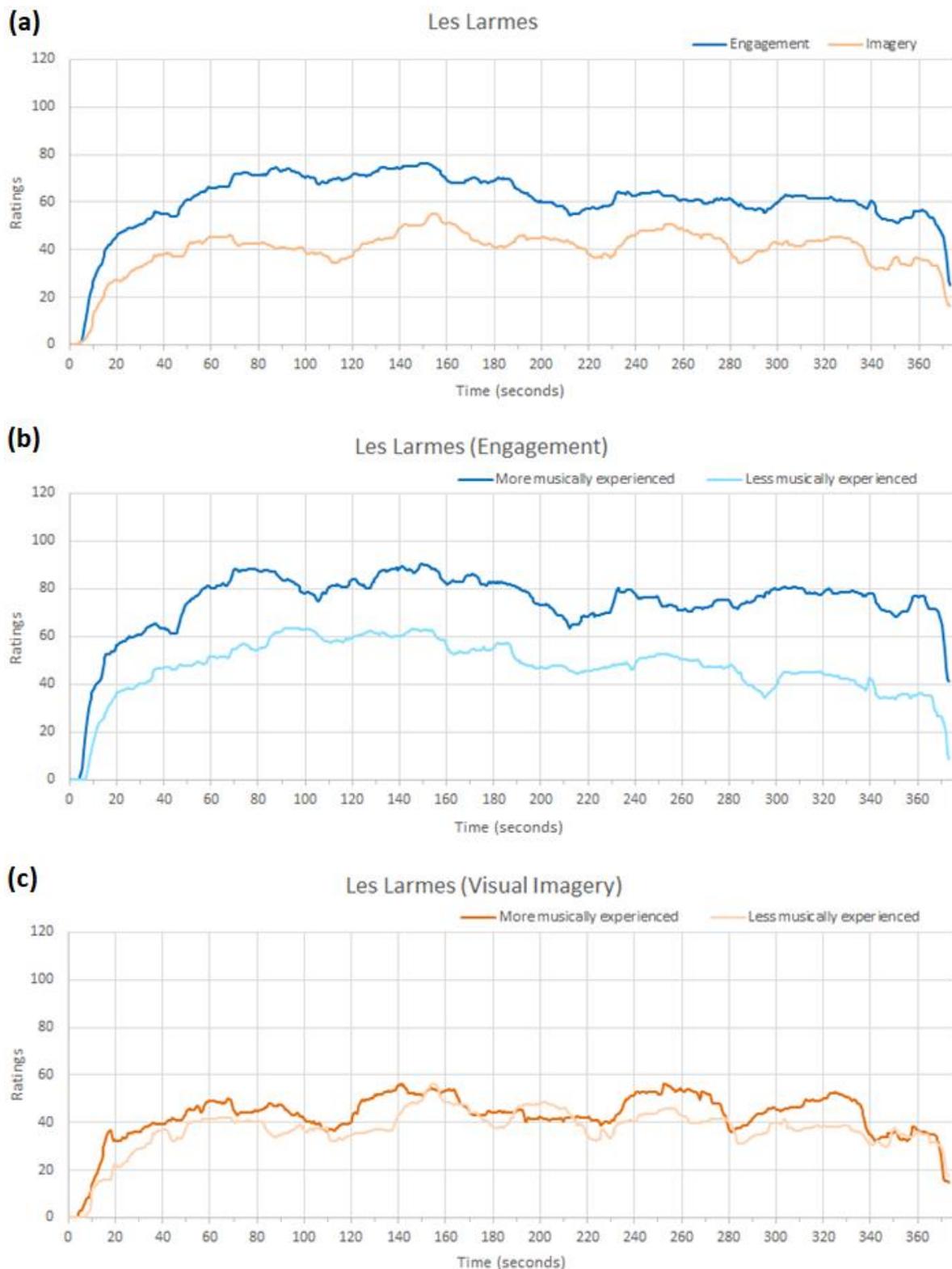


Figure 58. Responses to Rachmaninov's *Les Larmes*.

Panel (a) displays participants' overall mean **engagement** and **visual imagery** ratings (sampled every 0.5s) in response to *Les Larmes*. The two lower panels compare responses from the more musically experienced and the less musically experienced groups for engagement (b) and visual imagery (c).

The highest peaks in averaged engagement and visual imagery ratings for *Les Larmes* occur in close proximity, only five seconds apart; the engagement peak is reached first (Figure 58(a), blue line at approximately 150 seconds) and the imagery peak shortly afterwards (Figure 58(a), orange line, around 155 seconds). Like the previous piece, these peaks coincide with the first major climax of the piece (displayed in Figure 59, bars 24–25). This section also stands out as a peak for the music: not only in terms of dynamics, but also melodically, with regard to its register. From bar 17 (melody starting on B-flat5) the melodic material is repeated, gradually rising through various transpositions until bar 24 (the melodic pattern, now played in octaves, starts with its upper note on E-flat7); here, the music dynamically culminates in *fff*, before starting its descent, *diminuendo*, in the following bar.

The levels of mean engagement at the highest peak of the series are also very close to the engagement ratings at an earlier stage of the music (Figure 58(a), blue line, approximately 85 seconds in). This coincides with bar 14 (Figure 60), which presents contrasting musical features: soft dynamics, a steadier pace, and lyrical, contrapuntal melodies that overlap between the two piano parts. This suggests that, once again, although musical climaxes, or higher levels of musical intensity, generally coincide with higher engagement ratings, they do not constitute the only peaks of the latter—indeed, this is likely to vary to an even greater extent when participants' individual series are considered.

Figure 59 shows two systems of musical notation. The first system (bars 24-25) features a piano staff with a *fff* dynamic marking and a bass staff with *sf* markings. The second system (bars 25-26) features a piano staff with a *dim.* marking and a bass staff with a *dim.* marking. A blue horizontal line is drawn above the first system, and an orange horizontal line is drawn above the second system.

Figure 59. Bars 24–25 of *Les Larmes*; the top blue line provides an approximation of the highest peak in averaged (mean) engagement ratings, whilst the orange line indicates the highest peak in visual imagery ratings.

Figure 60 shows two systems of musical notation. The first system (bars 14-15) features a piano staff with a *pp* dynamic marking and a bass staff. A blue horizontal line is drawn above the piano staff. The second system (bars 15-16) features a piano staff and a bass staff.

Figure 60. Bars 14–15 of *Les Larmes*; the top blue line provides an approximation of a peak in averaged (mean) engagement ratings across the group.

5.3.1.3 Pâques

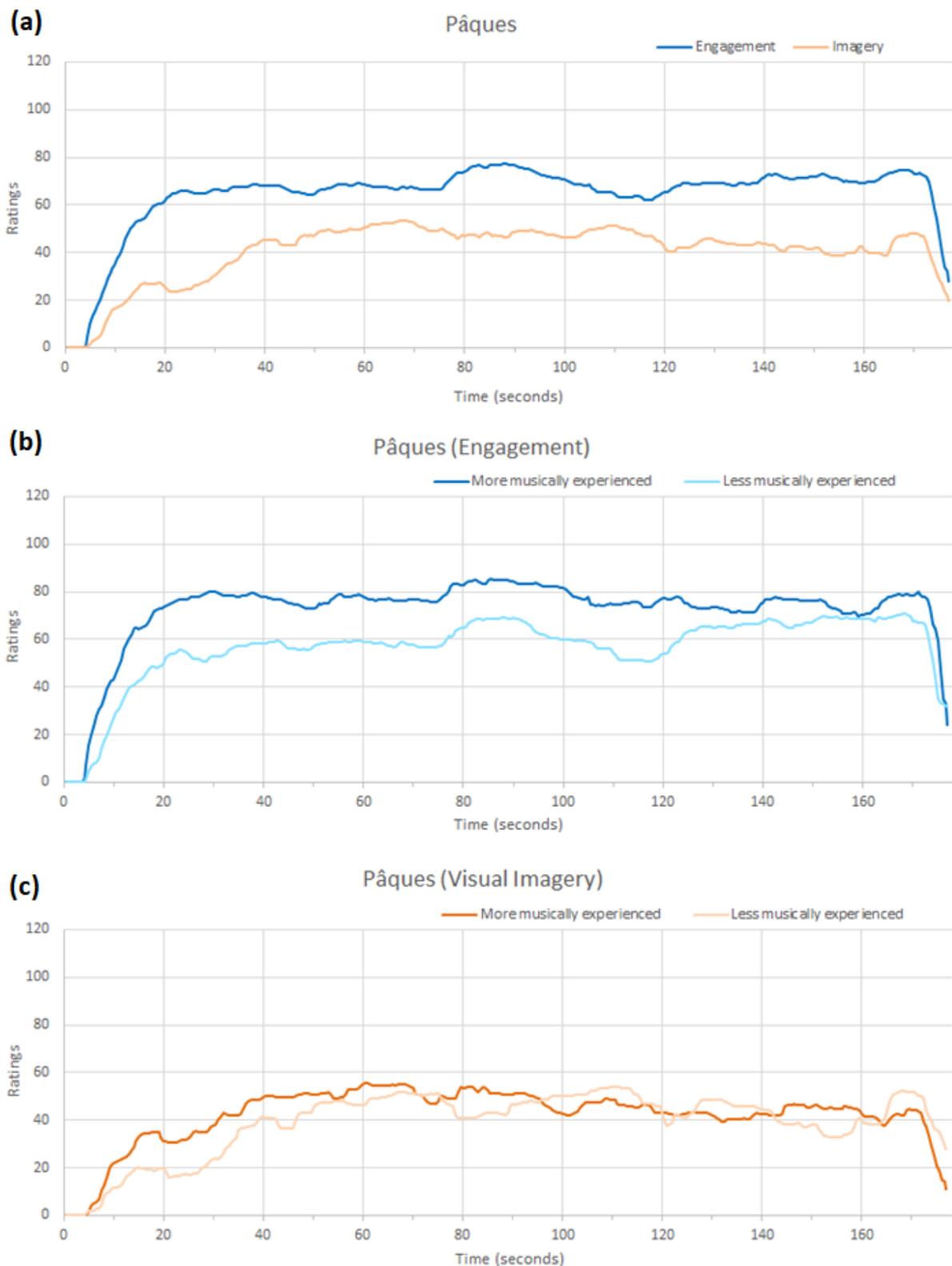


Figure 61. Responses to Rachmaninov's *Pâques*.

Panel (a) displays participants' overall mean **engagement** and **visual imagery** ratings (sampled every 0.5s) in response to *Pâques*. The two lower panels compare responses from the more musically experienced and the less musically experienced groups for engagement (b) and visual imagery (c).

Graphs of averaged engagement and visual imagery ratings for *Pâques* (Figure 61) show, to some extent, smoother series compared to the previous pieces; in particular, the visual imagery series presents more gradual increases or decreases in averaged ratings, resulting in less pronounced peaks and falls. This may be because a lack of substantial changes in musical textures or dynamics led to steadier averaged ratings across the piece. Regarding the highest mean ratings of engagement and imagery, these are reached with a slightly wider gap of approximately 20 seconds between them (see Figure 61) just before 90 seconds for engagement, and around 68 seconds for imagery.

The highest peak in mean imagery ratings, around bar 22 in the piece (Figure 62), occurs during a texturally intense passage of the music: bar 21 exposes the listener to a busier rhythmic thrust that develops from the alternating pattern of quavers and semiquavers (Piano I) of the preceding bar into continuous semiquavers. Despite the intensity of this passage, the musical material consists of repetitive patterns in both piano parts. By contrast, the highest peak in mean engagement ratings across participants takes place slightly later, in the first appearance of a lyrical chant that emerges from the chordal sequence played by the first Piano (Figure 63), where the peak is reached four bars into the start of the chordal theme^m.



Figure 62. Bars 21–22 of *Pâques*; the top orange line provides an approximation of the highest peak in averaged (mean) visual imagery ratings across the group.



Figure 63. Bars 27–30 of *Pâques*; the top blue line provides an approximation of the highest peak in averaged (mean) engagement ratings.

5.3.2 Tests of the Relationship between Engagement and Visual Imagery (Study 2)

Time series analysis (Dean and Bailes, 2010) was carried out on the continuous series of engagement and visual imagery among participants, following the procedure employed in the previous study: participants' series (for each task) were averaged per 0.5 second, differenced to achieve stationarity, and pre-whitened through the use of *R* (R Core Team, 2013).⁴⁸ As before, participants' engagement and visual imagery when listening to music was significantly related for each group (more/less musically experienced) and piece. Cross-correlation function (CCF) graphs of the global series (where all participants were merged into single engagement and visual imagery series) are displayed in Figure 64; further CCF graphs, for each group per piece, can be found in Appendix 8.

⁴⁸ For a more detailed summary of each step in the time series analysis, refer to Section 3.3.2 of this thesis.

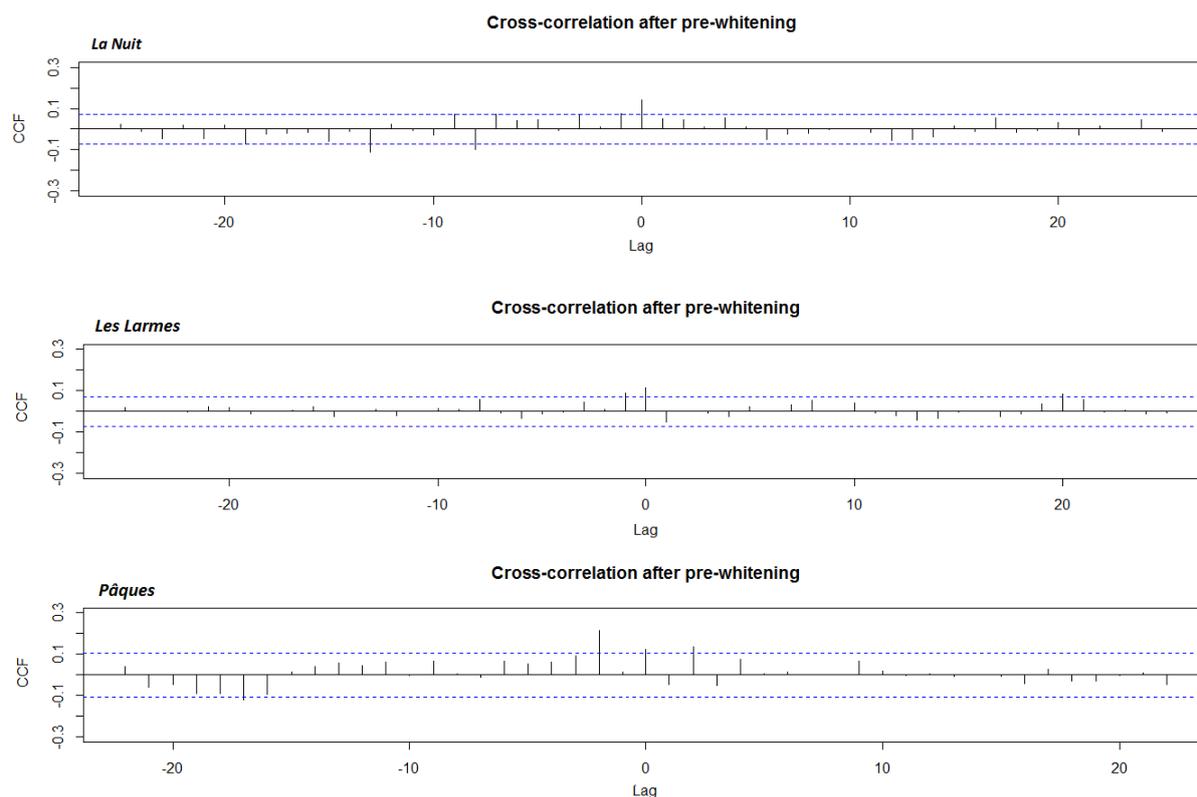


Figure 64. Cross-correlation function (CCF) graphs between pre-whitened engagement and visual imagery global mean series (all participants merged into a single group), per piece. Statistical significance is indicated by the vertical line/s exceeding the upper horizontal line.

5.3.2.1 Time Series: Granger Causality Test

To assess whether a statistical prediction occurred between one series (visual imagery or engagement) to the other, Granger causality tests (Granger, 1969) were conducted across each piece and musical experience group, as well as globally across the sample. The findings are reported in Table 20.

When grand mean series were assessed, a bidirectional relation emerged in both *Les Larmes* and *Pâques*; whilst only visual imagery predicted engagement in *La Nuit*. When groups were divided by musical experience, the results varied. On two occasions visual imagery only predicted engagement among the series of the more musically experienced group; engagement also predicted visual imagery in two instances, this time in both the more (*Pâques*) as well as less (*Les Larmes*) musically experienced groups. Both series predicted each other on two further occasions in the less musically experienced group: *La Nuit* and *Pâques*.

Table 20. Outcome of the Granger causality tests per group and piece, specifying the level of differencing required to achieve stationarity of the series (first or second order), the significant lags at which Granger tests are performed and the direction of the Granger causality.

Piece	Group	Granger Causality				F
		Differencing	Lag	Direction		
<i>La Nuit</i>	More Musically Experienced	Second-order	7	Visual Imagery → Engagement ***	4.97	
	Less Musically Experienced	Second-order	5	Engagement ↔ Visual Imagery	2.84	
				Visual imagery → Engagement *	3.82	
	Overall Group	Second-order	8	Engagement → Visual imagery **	2.19	
<i>Les Larmes</i>	More Musically Experienced	Second-order	8 ⁴⁹	Visual Imagery → Engagement **	2.77	
	Less Musically Experienced	Second-order	10	Engagement → Visual imagery *	1.85	
	Overall Group	Second-order	1	Engagement ↔ Visual Imagery	4.84	
				Visual imagery → Engagement *	4.27	
<i>Pâques</i>	More Musically Experienced	Second-order	4	Engagement → Visual imagery *	2.86	
	Less Musically Experienced	Second-order	4	Engagement ↔ Visual Imagery	8.72	
				Visual imagery → Engagement ***	4.38	
	Overall Group	Second-order	2	Engagement → Visual imagery **	5.02	
				Engagement → Visual imagery *	3.10	

Note. Arrows indicate the direction of statistical prediction at the reported lag. Lags at which an association was found are included, with each lag representing 0.5 s. * $p < .05$, ** $p < .01$, *** $p < .001$

5.3.3 Individual Differences (Study 2)

As for the previous study (Chapter 3), continuous data (engagement and visual imagery ratings) were averaged into single means to facilitate further statistical analyses in relation to individual differences. Based on the Shapiro-Wilk test, the assumption of normality was violated for the following Gold-MSI batteries: *Perceptual Abilities*, $W(40) = .91$, $p = .003$; *Musical Training*, $W(40) = .91$, $p = .004$; *Emotions*, $W(40) = .93$, $p = .020$; and *General Sophistication*, $W(40) = .94$, $p = .027$. Mean imagery scores in *Pâques* also deviated significantly from a normal distribution, $W(40) = .94$, $p = .023$. Spearman's rho (r_s) was therefore used for correlation tests involving these categories.

⁴⁹ Note. As shown in the CCF graph for *Les Larmes'* (more musically experienced group, Appendix 8), lag 3 was also particularly significant, with visual imagery predicting engagement ($F = 6.30$, $p < .001$).

5.3.3.1 Visual Imagery and Engagement

The results of correlation analyses of averaged visual imagery and engagement ratings largely reflect those in the first study (Section 3.3.3.1), but at even stronger significance levels. Mean imagery ratings for the three pieces significantly correlated, as did engagement ratings (Table 21). Surprisingly, unlike Study 1, the positive relationship between engagement and visual imagery—in addition to the time series analysis—also surfaced in the averaged ratings for one of the three pieces, *La Nuit*, where a moderate, yet statistically significant correlation was found between mean engagement and imagery ratings, $r = .36$, $p = .022$ ($r^2 = 13\%$). The possible challenges involved in employing mean reductions of continuous series for visual imagery responses have been discussed previously (see section 3.4); nevertheless, the emergence of such a finding provides additional support for a potential engagement–visual imagery link.

Table 21. (Study 2) Correlations between pieces for engagement and visual imagery ratings ($n = 40$).

Piece	Task	Piece			
		<i>La Nuit</i>		<i>Les Larmes</i>	
		Engagement	Visual Imagery	Engagement	Visual Imagery
<i>Les Larmes</i>	Engagement	$r = .60^{***}$		1	
	Visual Imagery		$r = .54^{***}$		1
<i>Pâques</i>	Engagement	$r = .48^{**}$		$r = .58^{***}$	
	Visual Imagery		$r_s = .56^{***}$		$r_s = .69^{***}$

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

As before, the Gold-MSI battery *Active Engagement* correlated with engagement ratings (this time for all pieces): *La Nuit*, $r = .39$, $p = .014$ ($r^2 = 15\%$); *Les Larmes*, $r = .46$, $p = .003$ ($r^2 = 21\%$); and *Pâques*, $r = .44$, $p = .005$ ($r^2 = 19\%$). Unlike the first study (Table 22), however, correlations between musical sophistication and engagement ratings were not as heavily orientated towards a particular piece. In Study 1, more ‘musically complex’ pieces showed stronger correlations with the Gold-MSI. In the current study, the incessantly strong dynamics and repetitive rhythmic patterns maintained throughout *Pâques* may be features that challenge the musical appreciation of some of the less musically experienced listeners. However, this is not reflected in the correlations. Instead, additional correlations were present for the engagement ratings in *Les Larmes*, which correlated with *Active Engagement*, as well as (more weakly) *Musical Training* and *General Sophistication* (see Table 22). A more pronounced difference in engagement ratings emerged between the more and less musically experienced participants in the averaged continuous responses graph presented earlier, Figure 58(b): in comparison to the other pieces, *Les Larmes* is marked by wider gaps between the more and

less musically experienced series, denoting greater differences in mean responses between the two groups. An additional aspect to consider is that all three pieces were written by the same composer; consequently, unlike Study 1, there is less stylistic variation between the stimuli. The imagery ratings in *Pâques*, however, correlated with *Emotions*, $r_s = .35$, $p = .026$ ($r_s^2 = 12\%$); although only moderate, such correlation could point further towards the emotions-visual imagery link discussed earlier. Visual imagery ratings in *Les Larmes* were also positively correlated, with a marginally significant p value, with *General Sophistication*: $r_s = .31$, $p = .050$ ($r_s^2 = 12\%$).

Table 22. (Study 2) Correlations between absorption, engagement ratings per piece, and subscales of the Gold-MSI.

Engagement Ratings	Goldsmiths Musical Sophistication Index Scores					
	Active Engagement	Perceptual Abilities	Musical Training	Emotions	Singing Abilities	General Sophistication
<i>La Nuit</i>	$r = .39^*$	$r_s = .25$	$r_s = .30$	$r_s = .12$	$r = .13$	$r_s = .33^*$
<i>Les Larmes</i>	$r = .46^{**}$	$r_s = .21$	$r_s = .35^*$	$r_s = .25$	$r = .16$	$r_s = .36^*$
<i>Pâques</i>	$r = .44^{**}$	$r_s = .12$	$r_s = .28$	$r_s = .31$	$r = -.06$	$r_s = .25$
Absorption	$r = .62^{***}$	$r_s = .50^{**}$	$r_s = .55^{***}$	$r_s = .65^{***}$	$r = .56^{***}$	$r_s = .63^{***}$

Note. Values in bold indicate significant correlations. * $p < .05$, ** $p < .01$, *** $p < .001$

5.3.3.2 Liking and Absorption

In line with the previous study, absorption ratings correlated significantly with musical sophistication scores—on this occasion, correlations were significant for each of the Gold-MSI batteries; with the strongest correlation emerging between absorption and *Emotions*, $r_s = .65$, $p < .001$ ($r_s^2 = 42\%$). Therefore, as before, more musically sophisticated listeners showed a propensity towards higher absorption experiences when listening to music. In addition, unlike Study 1, absorption scores also positively correlated with the mean engagement ratings for each piece: *La Nuit*, $r = .36$, $p = .023$ ($r^2 = 13\%$); *Les Larmes*, $r = .60$, $p < .001$ ($r^2 = 36\%$); and *Pâques*, $r = .41$, $p = .008$ ($r^2 = 17\%$). Additionally, mean visual imagery ratings correlated with absorption, albeit for one piece only: *Pâques*, $r_s = .35$, $p = .025$ ($r_s^2 = 12\%$).

As discussed previously, engagement when listening to music may also be linked to affective responses, which can have both positive as well as negative valence. Nevertheless, liking ratings once more positively correlated with mean engagement (displayed in Table 23). Unlike the previous findings, however, absorption only significantly correlated with liking ratings for one piece: *Les Larmes*.

Table 23. (Study 2) Correlations between participants' mean engagement and liking ratings per piece, and liking ratings and absorption scores.

Engagement Ratings	Liking Ratings		
	<i>La Nuit</i>	<i>Les Larmes</i>	<i>Pâques</i>
<i>La Nuit</i>	$r_s = .56^{***}$		
<i>Les Larmes</i>		$r_s = .40^*$	
<i>Pâques</i>			$r_s = .40^*$
Absorption	$r_s = .16$	$r_s = .38^*$	$r_s = .08$

Note. Values in bold indicate significant correlations. * $p < .05$, ** $p < .01$, *** $p < .001$.

5.3.3.3 Spontaneous Use of Imagery Scale Scores

Consistent with the findings of the previous study, no significant correlations emerged with the *Spontaneous Use of Imagery Scale* (SUIS). Correlation coefficients with mean engagement and visual imagery ratings were weakly positive (*La Nuit*: engagement, $r = .16$, $p = .339$; imagery, $r = .21$, $p = .196$. *Les Larmes*: $r = .18$, $p = .276$; imagery, $r = .10$, $p = .543$. *Pâques*: imagery, $r_s = .14$, $p = .386$), with the exception of a very weak negative coefficient with *Pâques*' engagement ratings, $r = -.02$, $p = .885$. Correlations were also mostly positive, but not statistically significant, with the Gold-MSI subscales (with correlation coefficients ranging from $-.02$ to $.20$). Similarly, SUIS scores weakly correlated with absorption scores, $r = .25$, $p = .125$.

5.3.3.4 Familiarity Ratings

Regarding participants' familiarity with the stimuli, the familiarity ratings for all pieces were significantly correlated (as shown in Table 24). This was also the case for familiarity of the musical style—a finding that was unsurprising as all pieces derived from the same composer and suite. The stylistic relationship between the three works is also reflected in the high correlation coefficients, which were stronger and statistically more significant than those in the first study. Hence, overall familiarity with one piece or musical style increased the likelihood of being familiar with another piece or musical style. As before, only a few participants were strongly familiar with the pieces; the low variation among participants' familiarity ratings could therefore have impeded the emergence of further, possibly significant correlations.

Table 24. (Study 2) Correlations between familiarity ratings of the pieces, as well as correlations between familiarity of the musical styles of the pieces.

Familiarity	Familiarity Ratings					
	La Nuit		Les Larmes		Pâques	
	Piece	Style	Piece	Style	Piece	Style
<i>Les Larmes</i>	Piece	$r_s = .50^{**}$		1		
	Style		$r_s = .88^{***}$		1	
<i>Pâques</i>	Piece	$r_s = .70^{***}$		$r_s = .68^{***}$		1
	Style		$r_s = .88^{***}$		$r_s = .88^{***}$	1

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

In contrast to the first study, style familiarity ratings for the pieces correlated with all Gold-MSI batteries except for *Singing Abilities*. Musical training showed the highest correlations with style familiarity: *Nuit*, $r_s = .53$, $p < .001$ ($r_s^2 = 28\%$); *Larmes* $r_s = .53$, $p < .001$ ($r_s^2 = 28\%$); and *Pâques*, $r_s = .47$, $p = .002$ ($r_s^2 = 22\%$). This suggests that the greater a person's musical expertise and knowledge, the more likely they are to be acquainted with the musical style.

5.3.3.5 More and Less Musically Experienced (ANOVA)

To test differences in ratings of engagement and visual imagery between more and less musically experienced groups, two ANOVAs⁵⁰ with repeated measures were conducted. These were conducted separately for engagement and imagery ratings, with a between-subjects factor of more/less musically experienced, and a within-group factor of piece (*La Nuit*, *Les Larmes*, and *Pâques*).

The first ANOVA was performed on ratings of engagement. The test showed a significant between-subjects effect (more musically experienced group: $M = 73.57$, $SD = 20.42$; less musically experienced: $M = 52.30$, $SD = 20.42$): $F(1, 38) = 10.84$, $p = .002$, ($\eta_p^2 = .22$); thus, as hypothesised, engagement ratings of the more musically experienced group were significantly higher than those of the less musically experienced group (Figure 65). By contrast, and unlike Study 1, the within-subjects effect 'piece' was not statistically significant: $F(2, 76) = .42$, $p = .662$, ($\eta_p^2 = .00$), indicating there was no significant difference in ratings of engagement across the three pieces, a similarity that may be attributable to the stylistic commonality shared by the pieces. The interaction between musical experience and the pieces was not statistically significant, $F(2, 76) = 1.00$, $p = .374$, ($\eta_p^2 = .03$); therefore, there was no significant difference in the way individual pieces were rated (in terms of engagement) between the more and less musically experienced groups.

⁵⁰ Whilst imagery ratings in *Pâques* significantly deviated from a normal distribution, as specified earlier, z-scores for skewness and kurtosis were nonetheless within the recommended ± 1.96 boundary to assume normality in small samples (Field, 2013).

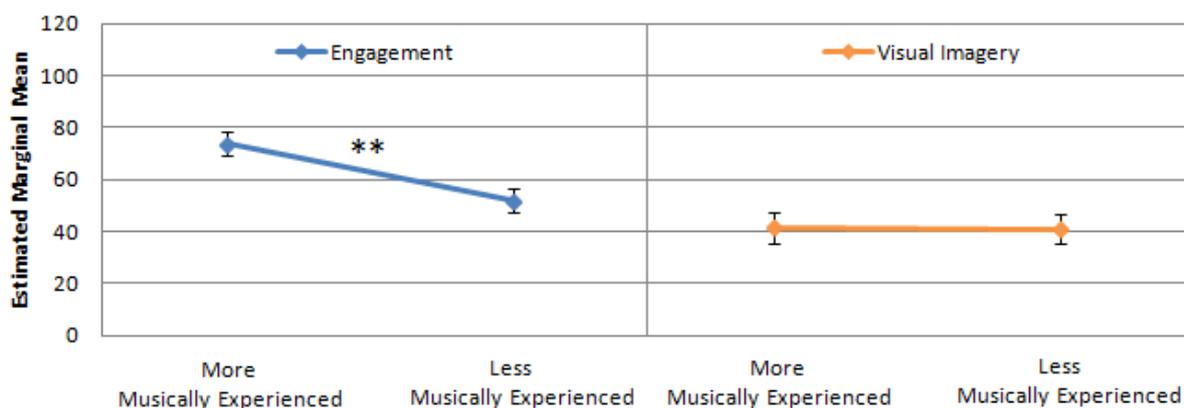


Figure 65. Comparison of estimated marginal means from the more and less musically experienced groups, as derived from ANOVAs independently performed on engagement ratings (left) and visual imagery ratings (right). Only the difference in engagement ratings between the two groups was statistically significant (** $p < .01$). Error bars report the standard error of the mean.

The second repeated measures ANOVA was conducted on ratings of visual imagery. In contrast with the previous study, overall ratings of visual imagery by the more and less musically experienced groups were, on average, surprisingly similar (see Figure 65, right panel). This was confirmed by the ANOVA, where imagery ratings of the more musically experienced ($M = 41.60$, $SD = 25.81$) and less musically experienced ($M = 41.05$, $SD = 25.81$) groups showed no significant difference: $F(1, 38) = .01$, $p = .947$, ($\eta_p^2 = .00$). Similarly, ‘piece’ was not a significant within-subjects effect in terms of imagery ratings $F(2, 76) = .37$, $p = .691$, ($\eta_p^2 = .01$). Once again, this could suggest a possible influence of the stylistic relatedness between the three musical works: similar musical styles may have resulted in greater similarities in imagery ratings being reported by the more and less musically experienced groups. Study 1, by contrast, comprised works by different composers and hence a greater disparity in imagery ratings was evident between the two groups.

It is important to note that visual imagery ratings from the synesthete participant were especially high throughout the three pieces,⁵¹ slightly rising above the average mean values of the less musically experienced group for *Les Larmes* and *Pâques*.⁵² Nevertheless, for the reasons discussed earlier, these ratings were still included in the sample and data analysis.

⁵¹ Synesthete participant's mean visual imagery ratings: *Nuit* ($M = 104.17$, $SD = 44.32$); *Les Larmes*, ($M = 101.93$; $SD = 44.23$); *Pâques*, ($M = 110.64$, $SD = 40.71$)—mean values which are more than double the average imagery ratings of the entire less musically experienced group (specified earlier).

⁵² Omitting the synesthete participant's data lowers the less musically experienced group's ratings for *Les Larmes* and *Pâques* (respectively) to $M = 33.77$, $SD = 26.06$; and $M = 35.18$, $SD = 29.98$.

5.3.4 Programmatic Information

The possible influence of programmatic details on participants' experience of visual imagery will be explored (5.6.2.5) with regards to the qualitative insights of this study. However, the present section provides a brief overview of the 'programmatic information' variable from a quantitative perspective.

Two repeated measures ANOVAs were performed separately on of engagement and visual imagery: this involved a within-subjects factor of 'piece' and, a between-subjects factor of 'programmatic information' (whether the titles of musical works and related poems were presented to participants before their listening tasks). The distribution of more and less musically experienced participants⁵³ was equally divided between participants presented with the programmatic information and those in the free listening condition.

Regarding engagement, participants who were presented with the programmatic details rated slightly higher engagement on average, than those without; this difference, however, was not statistically significant: $F(1, 38) = 1.75, p = .194, (\eta_p^2 = .04)$. Moreover, the 'piece' was not a significant within-subjects effect, $F(2, 76) = .42, p = .661, (\eta_p^2 = .01)$; nor was there a significant piece x programmatic information interaction: $F(2, 76) = 1.11, p = .333, (\eta_p^2 = .03)$.

Somewhat unexpectedly, the overall ratings of visual imagery exhibited opposing trends in relation to the presence or absence of programmatic information, as participants from the free listening condition averaged only marginally (not significantly) higher imagery ratings than the programmatic listening group: $F(1, 38) = .19, p = .668, (\eta_p^2 = .01)$. Congruent to the previous ANOVA, the within-subjects effect of 'piece' was not statistically significant: $F(2, 76) = .36, p = .698, (\eta_p^2 = .01)$ and the piece x programmatic information interaction did not emerge as significant, $F(2, 76) = .43, p = .653, (\eta_p^2 = .01)$.

5.4 Discussion

Forty participants provided continuous measures of engagement and visual imagery in response to three complete works for two pianos, selected from a late nineteenth-century four-movement suite; in the present study, audio stimuli comprised works by a single composer only. In support of the findings for Study 1 (Chapter 3), time series analysis established a meaningful relationship between listeners' experiences of visual imagery and their engagement with the music: therefore, the first

⁵³ Categories created from the ranking of the Gold-MSI *Musical Training* battery, as discussed earlier.

hypothesis was supported across the two studies. As before, time series analysis played a key role in the research process, as reductions of the engagement and visual imagery series into single means appears to prevent such a relationship from emerging; only grand means in *La Nuit* emerged with a significant, although moderate, positive correlation between the two ratings. A positive engagement–visual imagery relationship emerged in all Granger Causality tests performed across the sample; this was the case when participants were divided into more and less musically experienced groups⁵⁴ and when the entire sample was treated as a single group. In the latter case, a significant bidirectional relation was evident between engagement and visual imagery. When the groups were divided, visual imagery generally predicted engagement for the more musically experienced group (two out of the three pieces; the reverse was the case for in *Pâques*); whilst both series significantly predicted the other among the less musically experienced group—with the exception of *Les Larmes*, where engagement predicted visual imagery. Significant lags ranged from as small as 1, representing 0.5 seconds of time, to 10 (5 seconds), with occasionally larger lags (see Figure 64 and Appendix 8). Such observations, however, should be considered in context. The experiment was limited to the use of three musical works, and further research is required to gain a deeper understanding of whether, for instance, bidirectional significance of the series would emerge among a less musically experienced group of listeners. Both Studies 1 and 2 in this thesis yielded differing Granger Causality results for musical experience and piece. For instance, in Study 2, occasions in which visual imagery predicts engagement primarily occur among the more musically experienced group; in Study 1, however, it primarily occurs among the less musically experienced group. As mentioned earlier, further research on the possible influence of certain musical properties could help provide a deeper understanding of the complexities of this relationship.

As hypothesised, the more musically experienced group reported significantly higher levels of engagement than the less musically experienced group. With regard to visual imagery, however, overall ratings from the two groups were not significantly different. This contrasts with the previous study, where there was not only greater divergence in the imagery ratings of the two groups, but there was also greater variation across pieces. A possible explanation for this may be the similarity in musical style of the three works used in the second study: works by the same composer may have resulted in less pronounced differences between the two groups, unlike the previous study where there was greater stylistic variety between the pieces. On a broader level, musical style may therefore have had an influence on the possible disparity between the imagery ratings of more and less musically experienced listeners. The three Rachmaninov pieces resulted in particularly similar imagery ratings from the two groups; conversely, Leginska and Prokofiev (the two more musically

⁵⁴ Details of such divisions are provided and discussed earlier in the thesis (see sections 3.2.2 and 5.2.2).

complex works from Study 1) emerged as the pieces with greatest differences in ratings. Familiarity may also have played a role in this regard: for instance, Rachmaninov's musical style may be regarded as more familiar than the works of Leginska. However, further research is required for a deepened understanding of the role played by musical style in imagery responses among listeners. Previous studies have found a correlation between musical sophistication (based on selected Gold-MSI batteries) and the experience of visual imagery (Tavernaro, 2016; Küssner & Eerola, 2007); in the current study, a positive correlation emerged between imagery ratings in *Pâques* and the *Emotions* subscale of the Gold-MSI. Whether musical style has an influence on such correlations remains a topic for further investigation.

Consistent with the findings of Study 1, significant inter-correlations emerged between the imagery ratings for the pieces; this suggests that listeners providing higher ratings of visual imagery in one piece are also likely to provide higher imagery ratings in another. This was also the case for ratings of engagement. No correlations emerged, however, between imagery ratings and the *Spontaneous Use of Imagery Scale* scores. As discussed earlier (see also Section 3.4), further investigations are required to determine whether an individual's experience of imagery when listening to music differs, overall, from their use of imagery in everyday life—as measured by the SUIS. Observations based on alternative measures and methods would be helpful in exploring these aspects. Further attention should also be directed towards understanding the effectiveness, or weaknesses, of reducing the continuous ratings of visual imagery into single means, given the complex nature of the phenomenon.

In line with the previous study, a significant positive correlation emerged between participants' liking ratings and their engagement with the music: therefore, liking the music seems to lead towards higher ratings of engagement, or vice versa—although engagement may not necessarily have a positive valence, as discussed earlier. However, correlations between liking ratings and listeners' tendency to become musically absorbed (as measured by the *Absorption in Music Scale*; Sandstrom & Russo, 2013) did not exhibit the same consistency that emerged in Study 1's findings: instead, a correlation was only present in *Les Larmes*.

The present study introduced the addition of a further variable: the inclusion, or omission, of the programmatic details for each piece. These were presented prior to the start of the listening tasks and consisted of the original titles of the musical works and accompanying epigraphs (extracts of poems). From a quantitative standpoint, this variable did not produce statistically significant results (a qualitative exploration of this will be discussed later). Such findings are contrary to expectations when considering previous literature. For instance, programmatic information can provide a certain

orientation to the music listening experience (Meyer, 1956; Landy, 2006); and ‘musically congruent’ text descriptions may lead to more visual imagery being experienced by music listeners (Tavernaro, 2016).⁵⁵ Nevertheless, the surprising lack of a correlation may not necessarily reflect the downgrade of a work's programmatic details in relation to the experience of imagery; instead, it emphasises the potential for imagery emerging from the musical work itself. Experiences of visual imagery when listening to music are not necessarily prose-dependent, or rigidly attached to surrounding information at all times. In this respect, the argument introduced in the first chapter of this thesis is reiterated: absolute versus programmatic music cannot stand as a plausible concept, as each listener's perception and experience of imagery will vary—regardless of whether or not an accompanying description is given.

5.5 Quantitative Approach: Limitations

This study largely replicates, in its method and structure, the first empirical study presented in Chapter 3. Therefore, the limitations discussed earlier (Section 3.5) also apply in this study. An additional limitation, however, concerns the fact that the audio stimuli focused on a single composer—hence, restricting musical excerpts to a narrower musical style—as well as a fewer number of pieces. These works were, however, longer in duration, and nonetheless captured differing musical qualities and contrasting characters.

The programmatic listening condition could be explored further. The present study compared listeners who were presented with the titles of musical works and accompanying poems with those who were presented with no information. An extension to this research could compare different types of programmatic information, such as title only, poem only, or even further alternative formats. Furthermore, in the current study, programmatic details were presented to participants prior to the start of their listening tasks and removed after reading, without being re-presented for their second listening round. In a typical concert setting, however, such information (that is, programme notes) remains available throughout. Whether this affects a listener's experience of visual imagery or engagement could be explored further. Finally, the exploratory nature of this study should be emphasised: numerous other factors may have influenced the resulting averages from the different listening conditions or groups. Nonetheless, the studies unveiled some notable findings regarding the role of engagement and visual imagery in listening to music; further research will help extend our understanding in the field.

⁵⁵ Participants in this study were specifically asked to visualise the given prime.

5.6 (Study 2) Qualitative Exploration: Visual Imagery Types

As before, participants' written annotations of their experiences of visual imagery were analysed through the application of thematic analysis (TA; Braun & Clarke, 2006; Nowell et al., 2017).⁵⁶ The findings yielded the same nine types of visual imagery presented in Chapter 4 (Section 4.2.1), conforming to the expected findings suggested earlier and validating the visual imagery types proposed. Table 25 displays some examples of each type of coded imagery, extracted from participants' written annotations.

Table 25. Study 2's visual imagery types, alongside examples extracted from participants' visual imagery annotations.

Visual Imagery Type	Piece	Examples (Extracts form participants' annotations)
Arbitrary	<i>Larmes</i>	- Mind wandering (Isaac)
	<i>Larmes</i>	- Popcorns inside a basket in front of the bicycle, the motor of the jet starting on the campus, clouds, swarms of birds flying in the campus very nicely & harmoniously, autumn leaves—a tree near a lake & a slow stream going in the lake, I was standing near the lake & trying to see my face in the lake, there were ripples I could not see clearly my face, but what I saw was an old man with very long beard (reaching the floor) with his magical stick, heart, me and my little sister playing as a child, shoelaces woven nicely to each other, the train attacked to my stomach (Chloe).
	<i>Pâques</i>	- General things occurring in my day today (Isaac).
Emotions	<i>Nuit</i>	- Story of a young couple falling in love (Bethany).
	<i>Larmes</i>	- A crying boy, angry about some unfair situation. His mother teaches the boy about the realities of life. The boy stops crying. He has grown up a little, but lost his previous innocence and hope (Nick).
	<i>Larmes</i>	- Like ballerinas or an old fashioned circus. Quite nostalgic, wistful & sad (Hailey).
	<i>Pâques</i>	- Lots of people, women and children running, terrified (Marie).
Material Abstraction	<i>Nuit</i>	- Red, orange, yellow (Luke).
	<i>Nuit</i>	- I had some abstract imagery... (Querida).
	<i>Larmes</i>	- Blue, Grey (Luke).
	<i>Larmes</i>	- circles within each other (Marie).
	<i>Pâques</i>	- Red (Luke).
	<i>Pâques</i>	- Shapes representing music (Isaac).

⁵⁶ See Section 4.1 for further details on the choice of this method of analysis.

Musical Topics	<i>Nuit</i>	- Birds—cuckoo? (Luke).
	<i>Nuit</i>	- Birds, gulls at the coast (Qasim).
	<i>Nuit</i>	- Bird imagery throughout—trills/bird song at the beginning (Thomas).
	<i>Pâques</i>	- Bells are ringing... the church bells... it's a wedding (Sebastian).
	<i>Pâques</i>	- Open topped bell towers of russian orthodox churches, rows of bells pealing (Antonio).
Narratives	<i>Nuit</i>	- Dancers (one male, one female) interpreting the piece. At the end she is enclosed in his arms and they leave the stage together (Teo).
	<i>Nuit</i>	- Set in the ocean, with a whale/dolphin infant enchanted by the fish. The mother figure of the animal comes and takes the infant further out with a lot of darkness and strong currents. The mother loses her infant. Eventually they re-unite (Carmen).
	<i>Larmes</i>	- A ship battle is taking place, it feels like it's the 1800s. A man is on the deck shouting. He thinks about dancing with his partner. The ship crashes. He walks at dawn to a small coastal town. He sees his funeral there (Gabriel).
	<i>Pâques</i>	- Flock of birds + bird of prey. Hunting (Laura).
Performance	<i>Larmes</i>	- More contemplative sections; the pianist playing the piece in a reading room in the evening (several shelves of books) (George).
	<i>Pâques</i>	- Image of a conductor conducting an orchestra. The piano player is not following the commands. Fight between the conductor & piano player (Mathias).
	<i>Pâques</i>	- Music hall performance—really animated pianist—cymbals on the low notes (James).
Personal Recollections	<i>Nuit</i>	- My supervisor[']s face, me on a wheelchair, my sister's face when she was a baby (Chloe).
	<i>Larmes</i>	- Old memories—travelling with family, childhood stuff (James).
	<i>Pâques</i>	- Home (Nick).
Pictorial Associations	<i>Nuit</i>	- Tree lined avenue at night (Antonio).
	<i>Nuit</i>	- Film—brief encounter (Arthur).
	<i>Pâques</i>	- Quick flashes of images (Bethany).
Sound Associations	<i>Larmes</i>	- Reminded me of watching the film Koyaanisqatsi (Philip Glass)—going over the earth and seeing sights from the film (Arthur).
	<i>Pâques</i>	- Evoked circus imagery? With slightly crazy twist. Dead circus—Danse Macabre style (Thomas).
	<i>Pâques</i>	- A leader talking to the crowds (Nick).

Although coding for the present study was expected to follow the coding pattern used in Study 1, some participants surprisingly described their visual imagery specifically as ‘daydreaming’ (Isaac; *Nuit*); in *Les Larmes*, Isaac reports ‘mind wandering’ and ‘not as engaged’—once again emphasising the possibility of different kinds of visual imagery (in this case, arbitrary imagery as a result of not being engaged with the music). This led to a coding of *arbitrary* that did not require any further overlaps in coding as in this case the arbitrary element was specified by the participant.⁵⁷ As shown in the table above, examples of imagery saturation were especially present in Chloe's visual imagery, where she describes how ‘a series of images [were] coming so fast, some were very vivid, I wish I had taken a note out [sic.] of it while I was listening’. Unlike the first study, all coding of *emotions* included a visual reference—no emotions-related terminology was reported on its own across the annotations. It is also important to note how, for some of the more musically experienced participants, aspects of the audio stimuli influenced their imagery.⁵⁸ These included the ‘venue (resonant concert hall?)’ (Orlando; *Larmes*); ‘angry page turns’ (Orlando; *Nuit*); and imagery of the ‘piano make—very bright piano, hard hammers’ (Thomas; *Nuit*). Visual imagery annotations across the group also comprised a variety of instruments, such as ‘angels playing harp’ (Beatrice; *Nuit*); a ‘french horn’ (Thomas; *Nuit*); ‘a hand ringing on the triangle’ (Marie; *Pâques*); or a full ‘symphony orchestra’ (Luke; *Nuit*).

Once again, albeit to a lesser extent, some participants preferred to express their imagery through drawings. For instance, Querida describes her *narrative* imagery in *La Nuit* thus: ‘I saw (eventually) the limbs of dead trees blowing in the wind’ (Figure 66, left); ‘this changed/faded to a very stylized (art [Nouveau]) image of a maiden in a mom-like circle whose hair was likewise blowing’ (Figure 66, right). Chloe also provided a drawing (Figure 67) to emphasise her *emotions*-related and *personal recollections* imagery: ‘a face which was moving sadder and sadder and crying. This [the drawing] is the lips—this was a current incident that happened to me and made me cry, but it was also about mending things [and] I guess while relaxing during the music they came up’.

⁵⁷ As specified in Chapter 4, the *arbitrary* visual imagery type typically formed an additional layer of coding as a result of its (potentially) high degree of subjectivity.

⁵⁸ Audio stimuli for this study were recorded in a different studio than in Study 1, with different pianos and different recording equipment.

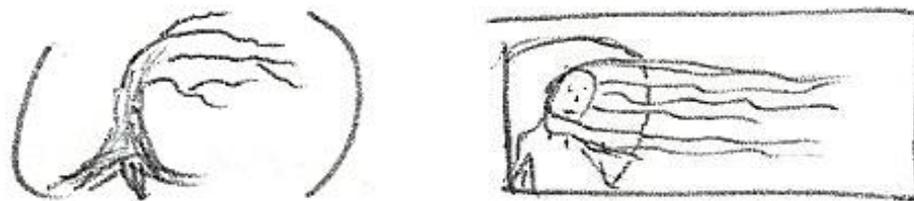


Figure 66. Querida's visual imagery annotations after listening to *La Nuit*.

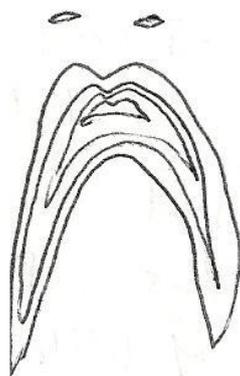


Figure 67. Chloe's imagery annotations after listening to *La Nuit*.

5.6.1 (Study 2) Shared Musical Topics

Some of the shared *musical topics* that emerged in this second study also appeared in Study 1 (see Section 4.2.2); this was the case for: birds, chase,⁵⁹ dance, death, horses, industrial, march, and water topics. However, new topics also emerged; Table 26 shows participants' shared *musical topics*-visual imagery,⁶⁰ alongside extracts of their annotations, in response to Rachmaninov's works.

Table 26. Topics emerging from participants' visual imagery annotations (Study 2).

Topic-related Imagery/ Theme	Piece	N. of References	N. of Participants	Examples (Extracts from participants' annotations)
Bells	Pâques	7	6	- A big bell being hammered (Nick). - Bells—brass bells (Luke).
Birds	Nuit	11	10	- A dark night in the forest with birds singing (Nick). - Birds circling high above in an orange + pink sky at sunset (Querida).
Chase/Hunt	Pâques	4	3	- A mouse being chased by an owl (Hannah). - Foxes, hunting (Rebecca).

⁵⁹ In this study, visual imagery linked to the 'chase' was joined by imagery related to 'hunting'.

⁶⁰ One participant expressed his imagery in a vague manner (that is, 'I think it's trying to invoke...'); however, his self-reported imagery indicates that, although briefly and at weak levels, imagery was nevertheless experienced.

Clock	Pâques	3	2	- Clock's ticking (Kameron).
Dance	Larmes	3	3	- Couple dancing (Marie). - Vivid images of dancing + dancers—a ballet (Qasim).
Dance	Nuit	4	4	- Dancers (one male, one female) interpreting the piece (Teo). - Two people “boy and girl” dancing in spring time (Igor).
Death	Larmes	5	4	- A funeral (Luke). - Death, sombre (Rebecca).
Funfair	Pâques	2	2	- Funfair, busy fair with a chinese dragon (James). - People at a fun fair, enjoying themselves and moving very quickly (Pamela).
Horses	Pâques	2	2	- Running towards the end horse + cart? (Daniel).
Industrial	Pâques	7	6	- A blacksmith at his anvil (...) metal machinery, like a steam engine (Antonio). - Machinery & construction workers with drillers, axes, etc. (John). - Victorian industry! Millworkers (cotton). Production workers etc... (Qasim).
March	Pâques	3	2	- Soldiers marching (Beatrice). - Marching crowds (Ken).
Pianto (Crying)	Larmes	3	3	- Then come the tears—the falling of droplets (Nathan).
Water	Larmes	11	8	- Rain drops. Rain on water. Pools & ripples of water (Luke). - The sea, waves—building up, crashing (Paula). - Lake + church at the lakeside. Ripples (Eric).
Water	Nuit	11	9	- Water, like bodies of water (Isaac). - Rain (Laura). - Waves at sea and on the beach (Ken).

Note. Nuit = *La Nuit*; Larmes = *Les Larmes*.

The busy rhythms, strong dynamics, and thematic^m repetition of *Pâques* were perceived through different topics across listeners. At times, these suggested negative connotations (e.g., the chase/hunt); at others, the imagery took a festive form (e.g., the ‘church bells’ of a ‘wedding’, as imagined by Sebastian). Other shared *musical topics* in this piece included the funfair, horses, industrial and clock-related visual imagery. *Pâques*' strong rhythmic drive was therefore a prominent feature linking many of these topics (Ken's imagery annotations, for instance, capture two of these topics—Figure 68). Dance-related visual imagery emerged in both *Les Larmes* and *La Nuit*, although at a lower frequency than the responses to Debussy in Study 1 (Section 4.2.2); imagery of water, however, was frequent in both pieces (an example shown in Figure 69).

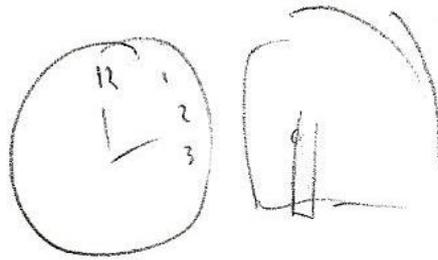


Figure 68. Ken's visual imagery annotations after listening to *Pâques*.

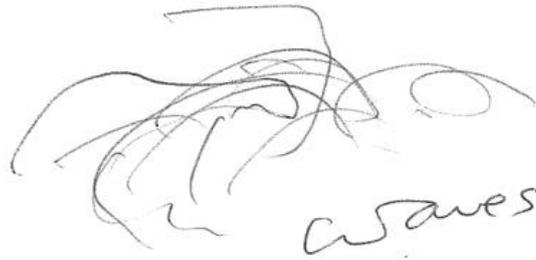


Figure 69. Ken's imagery annotations after listening to *La Nuit*.

5.6.2 (Study 2) Visual Imagery Types: Content Coverage

This section displays content coverage for each visual imagery type, obtained using NVivo's Matrix Coding query. The frequency and percentages of responses are provided in relation to the overall content of the annotations; participants' musical experience; gender; and piece.

5.6.2.1 Overall Content

Table 27 displays the overall content coverage of the nine visual imagery types,⁶¹ displayed as percentages (sum of column percentages = 100%).

Table 27. Coding coverage of each visual imagery type across the sample's annotations. The proportion of coverage of each type is displayed in percentages (based on word count) and number of coded references/cases.

Visual Imagery Type	Percentage	Number of Coded References	N. of participants
Arbitrary	7.37%	7	3
Emotions	15.91%	34	20
Material Abstraction	1.3%	14	7
Musical Topics	10.6%	71	30
Narratives	32.89%	55	29
Performance	10.43%	42	19
Personal Recollections	6.13%	15	10
Pictorial Associations	10.99%	60	25
Sound Associations	4.38%	16	12

⁶¹ Note. This study included a higher number of participants (n = 40) than Study 1 (n = 34).

The percentages reported were in similar proportions to the overall coding coverage in Study 1. As before, *narrative* covered the majority of overall coding; slightly higher than Study 1 was the *emotions* visual imagery type (+ 3%), whilst *musical topics* covered a slightly less percentage (- 6.09%): the number of people reporting this imagery, however, was almost identical (n = 29 in Study 1). Instances of *arbitrary* imagery were also slightly more frequent (+ 4.9%), possibly as a result of Chloe's rich 'imagery saturation' responses.

5.6.2.2 More and Less Musically Experienced

Although slightly fewer participants reported *material abstraction* types of visual imagery (Table 28) than in Study 1,⁶² the distribution of the imagery type (Table 29) confirms the hypothesis that musically trained participants engage more frequently in abstract kinds of visual imagery—or, as suggested by Tan and Kelly (2004), abstract ways of representing music. Another striking difference from the findings of Study 1 is the more drastic weighting of *performance* coding for the more musically experienced: this can be observed in the coding of overall visual imagery types for the two groups (Figure 70); furthermore, slightly more than double the number of more musically experienced participants reported *performance*-related imagery than less musically experienced participants. Although the distribution of *performance* coding in Study 1 was still greater in the more musically experienced group, this was reported more frequently by the less musically experienced group (n = 11) than the more experienced group (n = 7); and similar proportions were covered in terms of the overall coding of each group's (more: 18%; less: 16%) than in the current study (Figure 70).

Table 28. (Study 2) N. of participants coded for each visual imagery type across the sample.

Visual Imagery Type	More Musically Experienced (N. of participants)	Less Musically Experienced (N. of participants)
Arbitrary	2	1
Emotions	10	10
Material Abstraction	5	2
Musical Topics	17	13
Narratives	13	16
Performance	13	6
Personal Recollections	5	5
Pictorial Associations	16	9
Sound Associations	9	3

⁶² In Study 1, seven more musically experienced and three less musically experienced participants reported this imagery.

A research project at Duke University conducted by Ferreri (2016) showed that when a professional violinist listened, read, or imagined performing some pieces, brain areas responsible for planning movements were activated in all three tasks. In a subsequent interview, Overath⁶³ describes how ‘the musician’s brain is exquisitely sensitive to all aspects of music, be it listening, reading or imagining playing music (...) therefore, you engage a whole range of areas of your brain’ (Ibid.). This ‘sensitive’ way of listening may therefore lead to greater performance-related visual imagery—a research area that merits further exploration. Coding for *sound associations* and *musical topics* imagery types were also weighted more towards the more musically experienced (Figure 71).

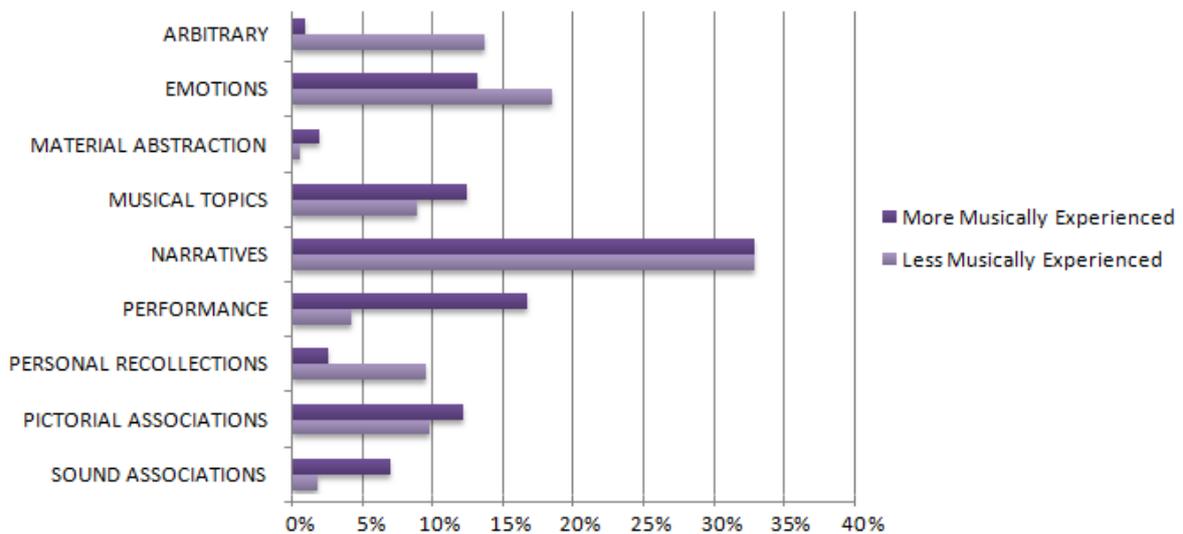


Figure 70. (Study 2) Bar chart displaying coding coverage of the visual imagery types for the annotations of more and less musically experienced groups.

Table 29. (Study 2) Coding coverage for each visual imagery type across more and less musically experienced groups, where the sum of the two groups' coding of visual imagery type accounts for 100% of the coding content.

Visual Imagery Type	More Musically Experienced	Less Musically Experienced
Arbitrary	6.13%	93.87%
Emotions	41.21%	58.79%
Material Abstraction	76.09%	23.91%
Musical Topics	57.87%	42.13%
Narratives	49.48%	50.52%
Performance	79.4%	20.6%
Personal Recollections	21.2%	78.8%
Pictorial Associations	55.01%	44.99%
Sound Associations	79.35%	20.65%

⁶³ Study conducted by Professors T. Overath and S. Lindroth and published in *Duke Today*.

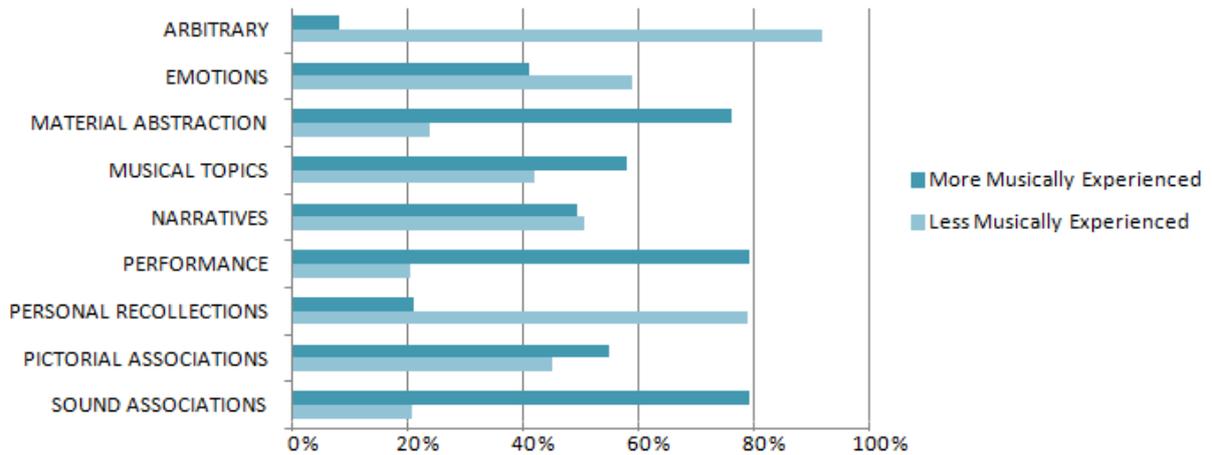


Figure 71. Distribution of each visual imagery type between more and less musically experienced groups in Study 2.

5.6.2.3 Males and Females

The distribution of visual imagery types between males and females (Figure 72) yield percentages similar to the coding in Study 1 (the larger *arbitrary* content in the female group, as noted earlier, is a result of one participant's extensive 'imagery saturation'). Although coverage of *emotions* is similar in males and females' imagery annotations, a greater number of females ($n = 12$) reported this (males = 8). Conversely, a greater number of males reported *topics*-related ($n = 18$) and pictorial associations ($n = 15$) than female participants (*topics* = 12; *pictorial associations* = 10).

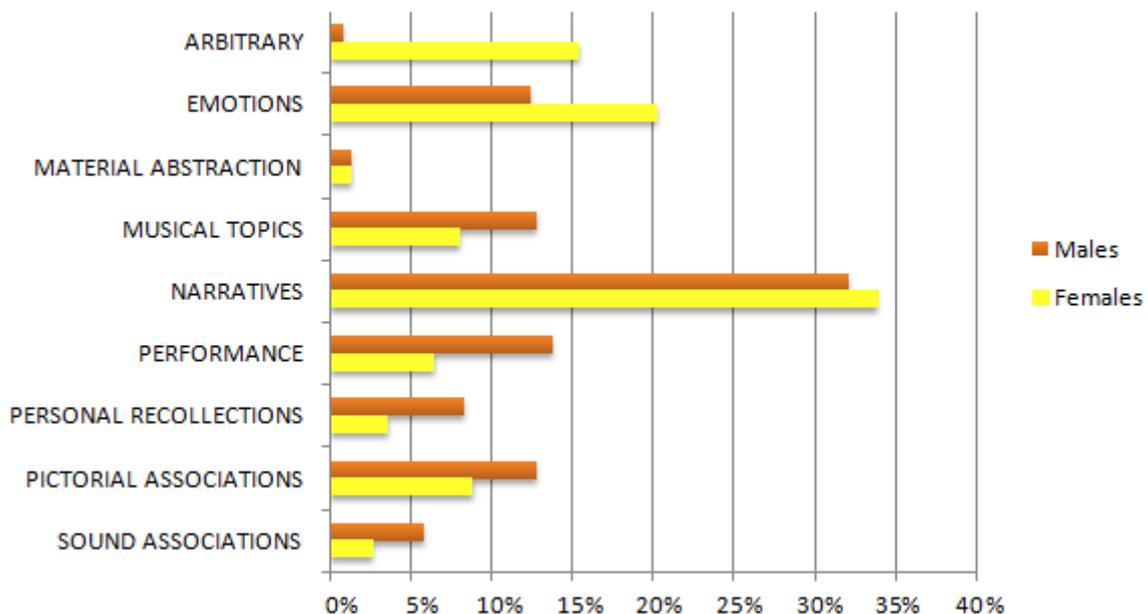


Figure 72. Coding coverage of visual imagery types across male and female participants for Study 2.

5.6.2.4 Visual Imagery Types per Piece

Table 30 displays the distribution of each visual imagery type across the three pieces. *Les Larmes* emerged as the piece with the largest amount of coding of *emotions* imagery: annotations included the ‘menacing anger’ of ‘a person sitting on the floor in a crowded hospital’ (Kameron); or ‘sorrow’ with ‘tears—the falling of droplets’ (Nathan). Another participant described remembering ‘your own reasons of tears, specially [sic.] as your beloved ones’ lives have faded... When it erupts back, you get a sense of the more “alive” moments of grief’ (Fabio). The prominence in this piece of *emotions* imagery (also visible in Figure 73, displaying the coverage per piece of visual imagery types) builds on Vuoskoski and Eerola’s (2017) findings that ‘the aesthetic appreciation of sad music is mediated by being moved’ (p. 1). The visual imagery experienced here may emerge from these emotions. A large proportion of the coding of *personal recollections* emerged in *La Nuit*; only around 8% of this imagery type was present in *Pâques*, the shortest of the three pieces. Whether the length of a musical work exerts an influence on any of the imagery types, however, requires further exploration.

Table 30. (Study 2) Coding distribution for each of the nine visual imagery types across pieces, where the sum of the coding of the four pieces accounts for 100% of the visual imagery types.

Visual Imagery Type	<i>La Nuit</i>	<i>Les Larmes</i>	<i>Pâques</i>	
Arbitrary	32.18%	42.15%	25.67%	= 100%
Emotions	25.93%	62.7%	11.37%	= 100%
Material Abstraction	32.61%	36.96%	30.43%	= 100%
Musical Topics	36.8%	33.33%	29.87%	= 100%
Narratives	26.29%	47.25%	26.46%	= 100%
Performance	33.33%	29.27%	37.4%	= 100%
Personal Recollections	63.13%	29.03%	7.83%	= 100%
Pictorial Associations	35.73%	39.59%	24.68%	= 100%
Sound Associations	29.68%	20%	50.32%	= 100%

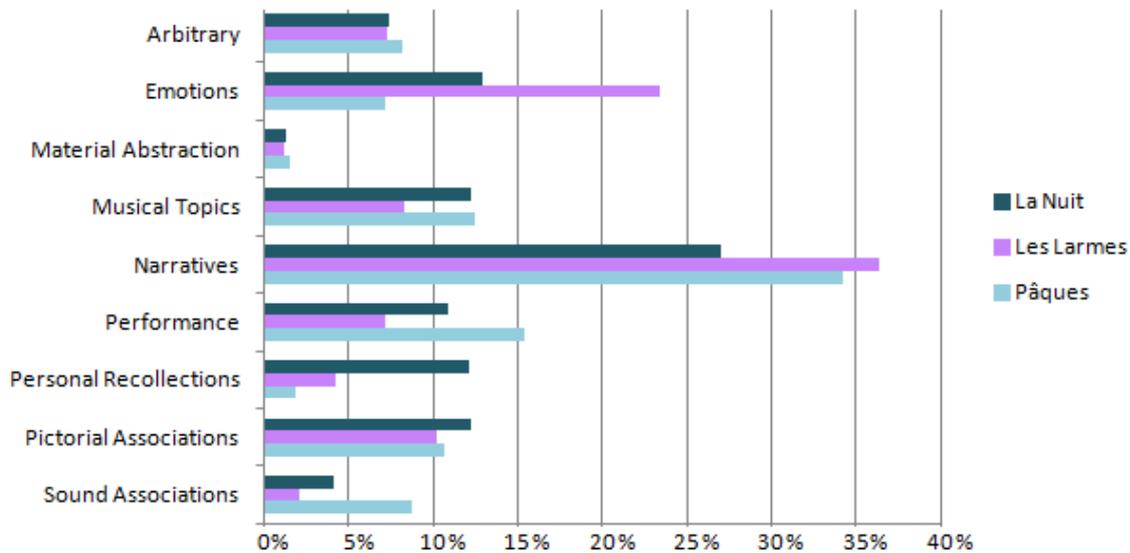


Figure 73. Coding coverage of visual imagery types (percentages) in each musical work (*La Nuit*, *Les Larmes*, and *Pâques*) for Study 2. The sum of visual imagery types in each work = 100%.

5.6.2.5 Extramusical Information

To explore the possible influence of extramusical information (title and epigraphs) for each piece on the content of participants' visual imagery responses, an additional layer of coding marked the congruency of the imagery. Key features of the epigraph for each piece were used as the threshold for this coding. Therefore, for *La Nuit*, images related to night; birds; lovers; water; or wind were coded as congruent. For *Les Larmes*, congruent imagery related: tears; autumn; night; and rain/water. Finally, for *Pâques*, congruent imagery related to bells or Easter/celebrations. The distribution of the congruency coding shows that the number of coded references were greater for listeners presented with extramusical information (41 coded references) than those in the free listening condition (33 coded references). However, contrary to expectations, the same number of participants from each of the two listening conditions (16 participants per condition) reported congruent visual imagery content. These findings highlight the potential of music to exhibit certain extramusical features, such as bird calls or bells. Among the responses in the free listening condition it was also surprising to find recurring features that, arguably, may be more difficult to capture musically, such as night (5 participants specified 'night' in their annotations; and one 'darkness'). Thus, participants' experiences of imagery with regard to the extramusical information they were given varied: whilst, for some, this influenced the content of their imagery, several listeners without any information on the pieces also reported 'extramusically-congruent' imagery content. Conversely, other participants preferred to intentionally ignore or deviate from the information given. Nathan, for instance, stated in the face-to-face interview that:

“...there's a lot of narrative, a lot of emotion... ehm... and a lot of pre-structured form to the music. And usually when I want to listen to a piece of music I want to put my own emotions to it. And I don't think any of those pieces I could very easily, because they were pre-structured (...) So when reading some of those titles, I wouldn't have put those titles with those pieces of music, personally”.

Other participants found a way of merging the poem's content with personal experiences, such as Fabio, who described in his imagery annotations for *Les Larmes* how the piece ‘makes you remember your own reasons of [sic.] tears’.

5.6.2.6 Coding Overlap

The overlap between the coding for the nine visual imagery types in this study is shown in a chord diagram (Figure 74).⁶⁴ Compared to Study 1, smaller proportions of coding overlapped between different categories. The majority of the overlapping occurs in the arbitrary imagery type, which mostly functioned as an additional layer of coding.

⁶⁴ Graph created using Circos 0.68 (Krzyszowski et al., 2009).

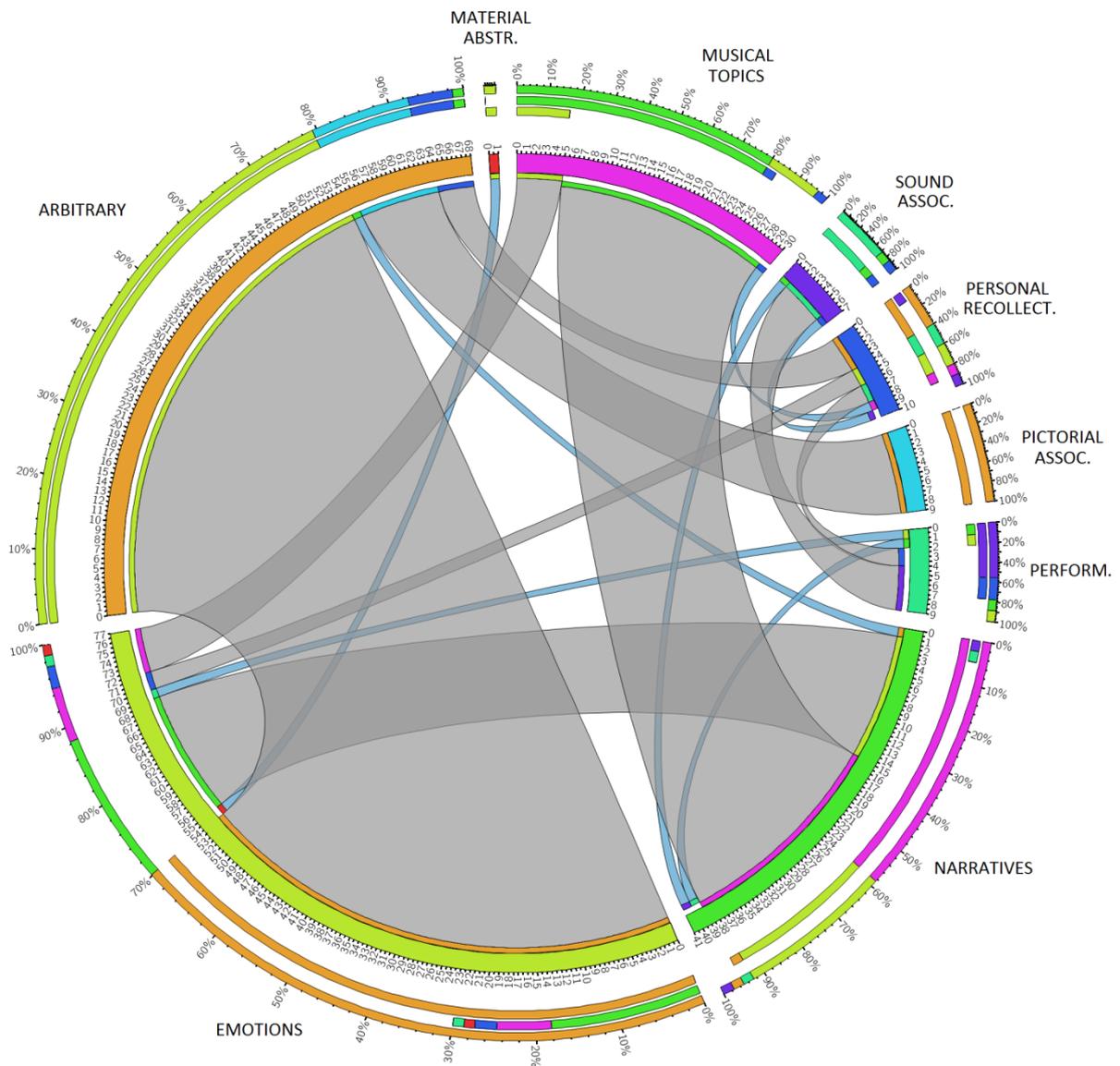


Figure 74. Chord diagram displaying overlapping coded content between visual imagery types in Study 2. The width of connecting ribbons corresponds to the proportions of coding overlap, based on word count. Outer straps indicate the relative proportion of overlapping categories for each segment (each colour refers to the relevant visual imagery type) in order of size (largest first).

5.6.3 Limitations

This study replicated the previous empirical investigation, presented in Chapter 4; therefore, the same limitations apply (see Section 4.3). However, this second study included a further variable, namely, the possible influence of extramusical information on visual imagery among music listeners. As mentioned previously, although this study made use of the original titles of the works and accompanying epigraphs, alternative approaches could instead employ either of the two—or even different kinds of information. The study also identified intriguing aspects that require further investigation. Further analysis of face-to-face interviews could also provide additional information on participants' experiences. For instance, as in the previous study, a number of participants were

surprised by their imagery experiences, describing how such imagery emerged from being engaged with the music:

“I was surprised by how much I did [imagine]. Because I... when I did the questionnaire to start with, I've put down I don't visualise things, I'm not... I don't do that. But actually as I was sat there, just focusing on the music, I did” (James).

It also appears that, for some, experiencing visual imagery leads to a preference for that music: *“music that I kind of... have strong visual images with I'd probably select and listen to it over and over again”* (Ken). Thus, there are several areas of empirical research worth pursuing further.

Chapter 6. The Performer as Listener

Chapters 3 to 5 of this thesis set out the visual imagery reported by a mixed group of music listeners, exploring their experiences through both quantitative and qualitative methods. The present chapter steps away from the empirical approach previously adopted. Instead, it scrutinises visual imagery through a different lens: the performer as listener. It largely focuses on a selective self-reflective account of the personal imagery experiences that arose in the course of the researcher's performance preparation. This not only directly relates to the performance component of the researcher's PhD, but also provides insight into a pianist's experiences and uses of visual imagery.

The imagery discussions below journey from practice to performance contexts, reflecting on the variety of imagery experiences that emerged when practicing and performing with a score, as well as performing from memory. The first section of this chapter introduces the benefits of visual imagery in music performance, through a selection of supporting studies in the field; this is followed by a personal reflection on the broad visual imagery process that can develop throughout the researcher's music practice (Section 6.2). The subsequent two sections explore personal imagery experiences in greater detail. Section 6.3 investigates the visual imagery conjured up during the practice of a two-piano duet work. The discussion will reference extracts of qualitative data obtained from a brief case study⁶⁵: two pianists (the researcher as Piano I, and a second pianist⁶⁶ as Piano II) provided free annotations of the mental images that emerged throughout their individual, private practice of the second, third and fourth movements from Rachmaninov's Suite No. 1, *Fantaisie-Tableaux*, Op. 5.⁶⁷ In contrast, Section 6.4 explores visual imagery in relation to a further variable: performing from memory. This section discusses ways in which visual imagery can compensate for the absence of the score. Throughout the chapter, imagery discussions are linked to the qualitative model presented in Chapter 4 of this thesis; each new encounter of a 'visual imagery type' will be pointed out (*in brackets and in italics*). This does not intend to set any restrictions on the personal reflections outlined below, but rather aims to observe whether the 'visual imagery types' model may, or may not, apply to a performer's visual imagery experiences—aspects also discussed in the closing Section 6.5.

⁶⁵ The pianists agreed to take part in the study through written informed consent. The study was approved by the School of Drama, Music and Screen Ethics Committee of the University of Hull on October 20, 2016.

⁶⁶ To maintain anonymity, this performer will be referred to as the 'second pianist' in future discussions.

⁶⁷ The following works were also recorded as audio stimuli for Study 2 of this thesis (Chapter 5).

6.1 Music Performers and Visual Imagery

The potential benefits of imagery in music performance practice have been well-acknowledged across a variety of studies, if not regarded as ‘increasingly obvious’ (Clark, Williamon & Aksentijevic, 2012:360). Previous research has underlined the different possible uses of visual imagery, and the ways these can assist various stages of performance preparation. For instance, imagery can be an important component in the memorization of a musical work: often in conjunction with other kinds of imagery—such as auditory or kinaesthetic—musicians may use visual imagery to mentally rehearse, imagining themselves playing the instrument or conjuring up mental images of the score (Holmes, 2005). In another study exploring the use of imagery (various modalities) during the performance of memorised music, Saintilan (2014) also highlight the idiosyncrasy of the phenomenon, describing how participants' comments ‘bring to light a system, unique to the individual, of inner representation of sound, activity, and images used by the musicians to structure their performing’ (p. 309). Holmes (2003) describes the way multi-layered imaging (visual, auditory, and so on) employed during practice may also imply emotional cues; as a cellist reported: when these various ‘triggers’ or ‘cues’ will have become automatic, ‘you are not thinking about the notes and the technique, it's just a pure act of communication’ (p. 229). Hence, imagery can also support the development of musical expressivity and refinement of performance skills (Clark, Williamon & Aksentijevic, 2012). Connolly and Williamon (2004) identified a range of imagery functions in classical conservatory students' practice routine: for instance, imagery may be used to ‘achieve peak experience’, ‘refocus attention during performance’, ‘establish a greater connection and presence with the audience’, among others (p. 225). Broader potentials of imagery in music performance include alleviating performance anxiety and regulating arousal levels (Bowes, 2009), or mentally preparing for a performance through a re-creation of the performance environment (Trusheim, 1991).

6.2 Visual Imagery in Piano Performance: A Self-Reflective Account

The brief overview above provides a sense of the increasingly recognised potential of visual imagery for music performers: imagery can be a powerful tool in helping to close the achievement gap of various performance goals. Nevertheless, it should be pointed out that the visual imagery conjured up by musicians is not limited to a set of pre-established images. Whilst, indeed, some of these images may be planned, consciously conjured up and manipulated—as in the recent examples—not all of performers' imagery experiences are necessarily anticipated. After all, the performer is also a listener; and just as with a listener, mental images may spontaneously unfold in the course of one's

music practice. Occasionally, it may be possible to identify the moment in which, in the course of the learning process, a mental image emerged or was created. For instance, certain visual imagery may be inspired externally to the spontaneous experience: a particular image prompted by a teacher during a piano lesson, for instance; or a fellow performer sharing his/her personal imagery experience. There may be times in which such 'learned mental images' are deemed so appropriate to the musical work, or parts of it, that they will remain—whether temporarily or long-term—in performers' minds. More frequently, the nature or origins of mental images are often difficult to establish.

The types of visual imagery that emerge during the practice or performance of a musical work tend to be more consistent. From personal experience, the development of these images grows alongside the learning of a musical work. Just as technical challenges consolidate through practice, so the imagery can become closely attached to certain passages, if not the entire piece. The next section provides a brief overview of how these mental images often go beyond the mere imagining of a particular scene or figure; instead, imagery can greatly assist the musical, as well as technical, approach towards a musical work. All music performers will be familiar with the extensive practice that leads up to a public performance. As a result, from a personal account, the visual imagery developed throughout the piece's preparation process would rarely change in a public context—at least, in terms of the major or strongest imagery. The evidence for this was gathered throughout the entire process, from practising alone, through to performance using the music, and finally performance/recording from memory. The greatest mutations of imagery in relation to a musical work were found to take place in the practice room, and possibly at the earlier stages of the learning process. This is perhaps rather unsurprising, since notes may be practiced as much as the associated mental image that goes with them. Nevertheless, this certainly does not exclude the possibility of being surprised by the rather unpredictable, spontaneous side of the phenomenon.

6.3 The Image in the Sound: Personal Examples

During the preparation process leading up to a recording session of Rachmaninov's *Fantaisie-Tableaux*, Op. 5., for two pianos (movements ii–iv), both the researcher and a second pianist provided free annotations of the visual imagery experiences which emerged throughout their private practice. The researcher provided a broader account of the imagery involved in each piece, including various links to technical approaches or wider musical concepts; by contrast, the second pianist provided concise descriptions of what imagery emerged in specific bars (examples of each are provided in Appendix 9). Whilst the imagery reported by both performers overall relates to the

extramusical connotations cited in the movements' related poems,⁶⁸ some of the imagery indicated by the second pianist at times deviates from these—although, unfortunately, no further details were provided as to what may have prompted such images. This was by no means unusual for the researcher's own music-related imagery; a mental image would not necessarily relate to the work's title, for instance (we will see later some examples of this). On this occasion, however, her imagery remained particularly pertinent to the extramusical information linked to the piece.

In *La Nuit... L'Amour* (No.2), both pianists reported visual imagery relating to love and birdsong (these included both *topics* and *pictorial associations* types of visual imagery). In the opening bars of the piece (Figure 75), nature-related images are present in both performers' imagery accounts, yet in different ways. The second pianist visualised an 'African woman singing into big landscapes', with a 'big red sun' and 'dawn' (bar 1), immediately followed by 'nature calling back' (bar 2). For the researcher, however, the loving theme predominates, and takes into account the second performer's piano part—supporting, as suggested by other studies, concurrent types of imagery modalities (as well as a *narrative* and *emotions* elements):

'This piece evokes in my mind a love courtship between two natural creatures. Particularly the conversation between the two piano parts at the beginning, evokes this imagery. It is not clear which animal, or at least it is not a consistent image throughout the entire piece, but it is very often a bird'.

Figure 75. Opening bars of *La Nuit... L'Amour*, second movement from Rachmaninov's *Suite No. 1, Fantaisie-Tableaux*, Op. 5.

The first pianist also references the nightingale cited in the poem, alongside bird-related kinds of imagery. She continues:

⁶⁸ Each movement was published with an epigraph, as earlier discussed in Chapter 5.

‘The poem mentions a nightingale, and the initial interval played by Piano II strongly evokes some kind of bird love call. To this call, the first piano’s response through spread chords feels proud, charming and elegant, and they create a strong connection between the two piano parts, as a response to one another. The spread chords reminds me of a peacock opening its colourful feathers to exhibit all his beauty’.

Further birdsong-related visual imagery emerged further in the piece for both performers. Interestingly, the second pianist marked bar 16 as ‘bird singing in trees’—slightly after the interval being played (Figure 76). At this point, the change in texture from the first piano led, instead, to a different kind of imagery for the researcher: ‘the soft, spread nonuplets evoke smooth water-like movements. Sometimes it comes into mind the gentle ripples created on the water’s surface, sparkling from the moon reflections. Technically, I try to make this passage flow’. Instead, ‘bird singing’ for the researcher is particularly vivid from bar 32 (Figure 77)—Piano I’s first appearance of trills, single-note repetitions and acciaccatura figures:

‘When I have these figures, I think more of how a bird’s voice would sound; to achieve this better, it feels like the music at this point does not require to be rhythmically overly strict (obviously still keeping the overall rhythm, but notes do not have to be necessarily metronomic). I try to make these singing calls bright and emerging from the left texture’.



Figure 76. Bars 14–16 from *La Nuit... L'Amour*, Rachmaninov.

Figure 77. Bars 32–34 from *La Nuit... L'Amour*, Rachmaninov.

It is interesting to notice the way the above description may come across as exclusively aural: a link between the sound of birdsong and the instrument's sound production; yet, reflecting back, visual imagery was, indeed, part of the process. Once again, this highlights the complexities involved in expressing and understanding one's imagery experiences—such data often requires a broader, contextual appreciation, and challenges the analytical processes if only 'literal meanings' are considered.

For the second pianist, the visual imagery in bar 32 emerged as a 'passionate couple'—intriguingly, two bars after the *amoroso* marking on the score. The entrance of the F minor chord in bar 40, however, seem to have brought a twist in the imagery experienced, of a 'couple arguing / realising this might be their last chance together'. During the same passage, starting from bar 36, the first pianist's visual imagery appeared, instead, less defined: '[here it] steps back from the bird image, to a broader singing theme^m. It is very passionate and of lyrical qualities. The image is more mixed and abstract here, but not less strong. Quality of a human singing voice'. It is only a few bars later that the love theme emerged for both performers. The second pianist annotated 'lovmaking' in bar 43 (Figure 78). Here, the first pianist draws a link to another piece (*sound association* visual imagery type):

'[It] strongly reminds me of the Fantasy Overture, *Romeo and Juliet* of Tchaikovsky, who, interestingly, is also the composer [to] whom Rachmaninov dedicated the suite. I inevitably connect [this] with the love theme^m, hence this idea of longing, love, warmth and emotionally reaching/getting closer to the desired person/half...'

Figure 78. Bars 43–45 from *La Nuit... L'Amour*, Rachmaninov.

In further reflections on the interaction between the two piano parts, the first pianist explains: 'I never had a clear idea if any of the [piano] parts "represented" a male or female, for instance. I never made this distinction, but there is nonetheless attraction between the two parts'. In bar 98, the researcher also describes:

'A love theme^m sang by a very low, warm voice. To create warmth and not a "menacing" tone quality, due to its low register, I tail off towards the end of the phrase. I have this idea of warmth particularly in mind—it's a passage that can easily be played sending the wrong message, due to its very low register'.

This contrasted with the second pianist's imagery: when the theme^m appears in the second piano part, this time in octaves, the image of a 'roaring lion, parading his territory' emerged instead.

These accounts provide an overview of the different ways in which particular imagery may arise and shape one's approach to a musical work. Further examples of this also emerged in the first pianist's visual imagery annotations for *Pâques*:

'A Russian native once explained to me that the actual translation of this piece's title (from the Russian) is not accurately described as "Easter", although it's close. It includes the idea of joy and light/bright. Since then, particularly in this opening, the colour white often comes into mind, or a kind of light so bright that its colour is intense and luminous. When the theme^m returns, doubled by further octaves from the end of bar 8, these are larger bells: they have richer sonorities; hence, in my mind, the image and sound seem now on a larger scale. For this, the attack to the keys is from further a distance, striking from above but still aiming for a sonorous sound than a harsh one (at this end, the hand strikes flat on the keys' surface with a fast attack, yet without overly "digging into the keys")'.

It has been possible to observe the way visual imagery between the two performers was frequently linked by a common idea or theme, but at times these differed.⁶⁹ Whilst rehearsal time to develop as an ensemble was particularly limited in this case study, there is, however, also potential for visual imagery within an ensemble context. If imagery can facilitate stylistic approaches, add a level of inspiration and support musical expression (Trusheim, 1991), an ensemble may also benefit from shared imagery experiences: for instance, imagery could help to work towards shared interpretational goals; improve ensemble cohesion; and give rise to creative teamwork towards performance excellence—an intriguing area of research for possible future investigations.

6.4 Visual Imagery and the Process of Memorizing

Reflecting further on the personal experiences of visual imagery during practice sessions, most instances of imagery (in particular the more ‘figurative’ kind, such as *narratives* or *pictorial associations*) tend to occur primarily during ‘flow’ states—the goal-orientated, ‘in the zone’ state of mind (Csikszentmihalyi, 1990). It was discussed earlier that visual imagery can develop alongside the interpretation of a musical work: just as interpretative ideas grow from the initial, fragmented thoughts during the practice of a new musical work, so do the mental images for that piece. However, in order to deeply engage and be immersed in the imagery experience, it is perhaps unsurprising that a certain technical control is first required—not only to focus on the musical expression of a given piece, but also to unleash the imagery that emerges or is conjured up in the mind. This does not exclude the experience of visual imagery during the early stages of a musical work’s learning; yet, the deeper experiences of imagery (possibly also in terms of their duration) are more likely to occur when a certain technical proficiency of the piece is achieved, when chances of being drifted away from that ‘in the zone’ state are reduced. In a similar way, playing through a certain passage of the music may give rise to vivid mental images; however, the moment that passage becomes the focus of specific technical goals (for instance, by separately practising the passage through repetitions or subdividing it into smaller units), this can often divert the focus away from the broader picture created in the mind—interpretative, as well as imaginative. This further supports the argument at the heart of this thesis, that an engaged mind can promote one’s mental images in relation to the musical work; and that this can apply to listeners, as shown in the previous empirical studies (Chapters 3 and 5), as well as performers.

⁶⁹ See Appendix 10 for a video presenting the two performers’ visual imagery descriptions in line with the music.

The types of visual imagery mentioned so far concern primarily types of mental images which linked, in one way or another, to the interpretative understanding or perception of a musical work. The previous discussions involved visual imagery types such as *topics*, *narratives*, *pictorial* and *sound associations*; however, when considering the types of visual imagery that may emerge whilst performing from memory without a musical score, a new layer of complexity is encountered. Deciphering or expressing the exact visual imagery process which occurs whilst performing a memorised piece is, often, not an easy task—we have already encountered such difficulties in participants' personal accounts of their imagery experiences during music listening. Nevertheless, what particularly stands out from the point of view of a performer is the way visual imagery can significantly assist the memorization (and memorised performance) of a piece. As mentioned earlier, the way visual imagery can support performers' memorization of the music has been widely supported in various studies (examples include Ginsborg, 2004; Connolly & Williamon's 2004 review on mental practice skills). Visual imagery offers 'a convenient way to navigate from one section to another' (Mountain, 2001), and can be employed strategically when memorising music (Kvifte, 2001; Ginsborg, 2004; among others). Reflecting on personal experiences of performing memorised music, visual imagery enables a kind of personal 'mental mapping' of the musical work, by means of providing the visual support which would be normally obtained with the use of a music score. These kinds of mental images do not replace the visual imagery types mentioned earlier; they are also not conjured up for extensive periods of time, when compared to the other types of visual imagery. Instead, they tend to occur only briefly, yet at (generally) specific moments of the piece. One way of considering these moments may be as 'memory signposts', which occur throughout the piece: these key 'referential points' tend to mark particular changes in the music, such as the start of a new section, new patterns or considerable shifts of hand positions. In order to provide a practical example of this, personal imagery experiences for Poulenc's 'Caprice Italien', third movement from his *Napoli Suite*, will be discussed.⁷⁰

'Caprice Italien' is an energetic, fast-paced work, comprising a variety of smaller sections which capture different musical nuances—and different 'musical images'. In a matter of bars, the music transits through a tarantella, a serenade, a waltz and a march, among others. The personal visual imagery experiences throughout the piece are just as fast changing. The lively opening evokes various images of a busy, festive and crowded open space; there is a particularly popular (folk) feel to the scene. The entrance of the tarantella section which follows, beside the new thematic^m

⁷⁰ A video of the researcher's memorised performance of this piece may be seen in Appendix 11. An additional memorised performance may be seen in Appendix 12 (Janáček's *In the Mists*)—whilst this was part of the research process, it was excluded from the discussion, as it was found not to add significantly to the aspects explored in this chapter.

material and change of texture (up until that point the left hand mostly comprised on-the-beat staccato notes, octaves or chords), also presents a considerable leap from the low register of the piano to further up on the keyboard (Figure 79; tarantella theme^m starting in bar 31). The fast pace of the music requires a particularly deft movement of the hands, not only to approach the initial notes of bar 31 within a particularly short time-frame, but also with the fingers ready on the notes which follow (the latter point especially relevant for the left hand). A visual example of the hands' positions at the start of the tarantella theme^m may be seen in Figure 80: whilst approaching this passage, it is often the image of the hands' positions on those keys that is conjured up during playing (*performance visual imagery type*). As mentioned earlier, this is only brief; yet, long enough to ensure the right keys are targeted in the leap. Just as in Chaffin and Imreh (2002), performance cues are utilised as retrieval cues: the image of the hand position here is particularly ingrained as a personal representation of this section, beside the pictorial kind of imagery linked to its tarantella element. In the absence of the score, performers are required to rely uniquely on their memory, and such points in the music are of particular support. Although more difficult to identify, it may also be possible for these mental images to be accompanied by some kind of kinaesthetic or tactile imagery.

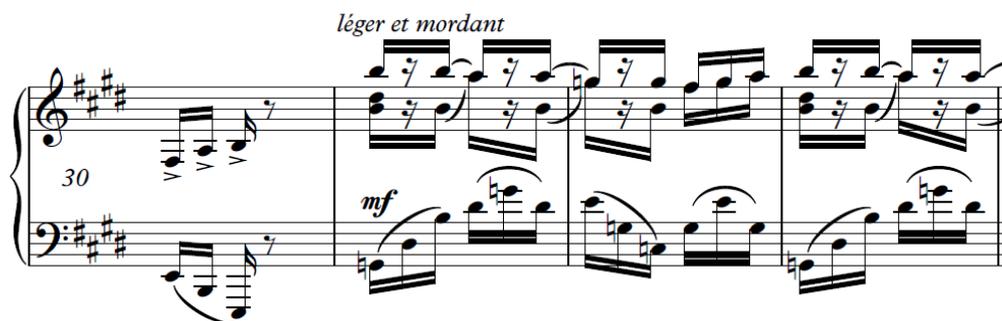


Figure 79. Bars 30–33 from Poulenc's 'Caprice Italien', third movement of *Napoli* suite.



Figure 80. Position of the hands at bar 31 of Poulenc's 'Caprice Italien', the start of the tarantella theme^m.

A similar instance of a *performance* visual imagery type occurs slightly later in the piece, in bar 80 (second quaver of the bar): although, once again, the hands move across a large leap (see Figure 81), a feature which particularly stands out when playing this passage is the way the hands overlap (Figure 82) until the end of the following bar. In a similar manner, the image of this hand position tends to come briefly into mind just before the passage is played. The musical material enclosed in bars 80–90 diverges from the captivating themes^m encountered in the previous section of the piece. Instead, it appears as a playful series of rhythmic patterns, at times slightly dissonant (such as the semitone interval between the two hands, bar 81). Possibly as a result of these contrasting musical features, the personal imagery and consideration of this section relates to a series of musical patterns—a focus which perhaps may have also been influenced by the *très articulé* indication at the start of bar 80 (Figure 81). An example of this is the imagery of two parallel lines in bars 82–83, matching the rising and falling outline of the notation (*material abstraction* visual imagery type), in which the two hands' lines keep a third apart from each other.

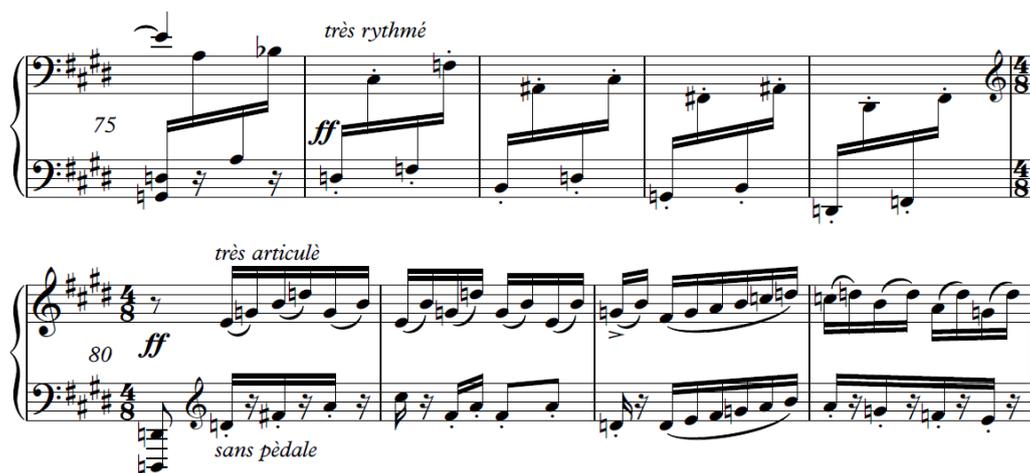


Figure 81. Bars 75–83 from Poulenc's 'Caprice Italien'.

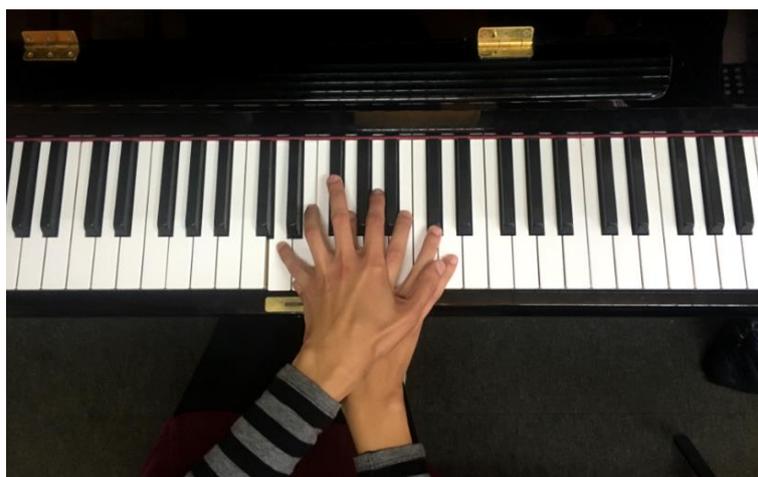


Figure 82. Position of the hands at bar 80 (second quaver) of Poulenc's 'Caprice Italien'.

Finally, a further memory support is at times obtained from brief, intermittent visualizations of the score (another form of *material abstraction* visual imagery type). Once again, this occurs at specific moments in the piece, and generally the start of particular sections. Reflecting on the imagery examples given above, it is interesting to notice how the *performance* and *material abstraction*-related imagery did not emerge, at least as strongly, as in a previous performance of the ‘Caprice Italien’ which made use of the music score. Whether this is due to the performer not paying much attention to these kinds of visual imagery—not being considered as significant, compared to a memorised performance context—when a score is employed, or whether such imagery types tend to arise more prominently when performing memorised music, are questions worth investigating further in future research.

6.5 Discussion

The personal visual imagery experiences reported above linked to most of the visual imagery types captured by the qualitative model (Chapter 4). The self-reflective imagery accounts included *musical topics*, *sound associations*, *emotions*, *material abstraction*, *narratives*, *performance* and *pictorial associations*, providing further support to the ‘visual imagery types’ model introduced in Chapter 4. Therefore, these visual imagery types seem to apply also for the visual imagery that emerge during the practice or performance of a musical work. Table 31 summarises the visual imagery types encountered in the discussion above, alongside the context (practice/performing with a score, and performing from memory) in which these were discussed. Although this discussion only presents a selection of musical works and related visual imagery types, it nonetheless gives rise to intriguing reflections. For instance, the way visual imagery—and, as a result, the visual imagery types—seem to consolidate the interpretation of a musical work: these often maintain a certain consistency, forming the same mental images, whether practising or performing a piece. However, performing from memory seems to place a new emphasis on *performance* and *material abstraction* imagery types. The way *performance*-type imagery also emerged for brief instances, yet at specific moments, seems to be supported by other studies as a helpful memorization strategy: Ginsborg (2004) suggests that visual memory can be an unreliable technique when used in isolation; however, this is most fruitful when used deliberately, deciding ‘which information will serve as the most reliable cues’ (p. 130).

It goes without saying that these images could also be experienced whilst practising or performing with the use of a score. For some individuals, perhaps, performing from memory could even lead to opposing results: memorised performances would require additional concentration and focus to

remember the notes, perhaps distracting from the broader imagery experience. These are all potential areas for future investigations.

Table 31. Summary of the visual imagery types emerged in the researcher's self-reflective account of mental images during music practice/performance, and their context.

Visual Imagery Type	Example	Practice (Score)	Performance (Score)	Performance (Memory)
<i>Arbitrary</i>				
<i>Emotions</i>	Lovemaking	✓	✓	✓
<i>Material Abstraction</i>				✓
<i>Musical Topics</i>	Birds singing	✓	✓	✓
<i>Narratives</i>	Bird courtship	✓	✓	✓
<i>Performance</i>				✓
<i>Personal Recollections</i>				
<i>Pictorial Associations</i>	Natural images	✓	✓	✓
<i>Sound Associations</i>	Love themed imagery (linked to Tchaikovsky's Fantasy Overture)	✓	✓	✓

Although most of the visual imagery types were also found in the self-reflective discussion (seven out of nine), it should be noted that small adjustments of the model are required when considering single case studies, as opposed to multiple participants. In particular, the *shared musical topics* (for more on musical topics, see Hatten, 2004; Monelle, 2006) cannot be applied as ‘recurring images’ in the case of a single performer. In these cases, recognition of topic-related imagery would rely entirely on the researcher's understanding of the music and the experience reported—an approach which is likely to broaden up significantly the *musical topics* theme, confining the *sound associations* imagery to links made to external sounds of non-topical kinds (e.g. associations made to another musical work). Research on topics is gaining ground (more recent contributions include Sheinberg, 2012; and Tarasti, 2012), and further investigations on contemporary perceptions of topics in the music of the Western art tradition would be beneficial in this respect. An alternative approach to the model, instead, may consider the combination of *musical topics* and *sound associations* into their overarching theme of aural associations.

Interestingly, no *arbitrary* and *personal recollection* types of visual imagery emerged. A possibility for the lack of *arbitrary* imagery may be that, in the course of annotating music-related imagery, this was deemed irrelevant and, as a result, less effectively captured; alternatively, and more simply, less attention was paid to this kind of imagery. With regards to the *personal recollections* visual imagery type, it may be that a performer's personal memories perhaps emerge more easily if the personal experience is explicitly affiliated to the piece being performed.

To summarise, the experience of visual imagery during music performance, particularly when memorised, is a complex, idiosyncratic process. The discussions above conform with Saintilan's

(2014) findings, since a combination of different visual imagery types were employed by the researcher in forming an inner representation of the piece, supporting different aspects of a musical work's performance. Saintilan also describes the way multimodal types of imagery may co-occur in a layered manner (p. 313). Drawing from the present study it may added that, even when considering just the visual modality, multiple types of visual imagery may interweave within the performance of a single musical work.

7. Concluding Remarks

The present thesis explored engagement and visual imagery in music listeners' responses to Western art piano works. The research set out to investigate two broad research questions, enquiring (1) what contributes to the experience of visual imagery; and (2) in what ways do music listeners experience visual imagery. This was explored through the use of a mixed-method approach: two empirical studies gathered both quantitative and qualitative data, enabling insights of where in the music and at what levels engagement and visual imagery was experienced, as well as the content of these responses. In addition, a self-reflective account encompassed visual imagery from a performer's standpoint, providing a first-hand exploration of imagery experiences, whilst providing an additional perspective on the phenomenon. The following discussion gathers the thesis' key findings in relation to its aims and the broader research questions.

7.1 Research Findings

7.1.1 Aim 1

Aim 1: To assess whether a relationship is present between visual imagery and real-time engagement with music.

Both empirical studies revealed a positive relationship between visual imagery and engagement through a time series analysis of participants' continuous engagement and visual imagery responses, suggesting that listeners' experiences of visual imagery are likely to occur whilst they are more strongly engaged with the music they are hearing. When investigating the direction of the series' statistical prediction (engagement predicting visual imagery or vice versa), different findings seem to emerge when observing different factors, such as musical experience or different musical works. The positive link between engagement and visual imagery is in line with existing literature which, although seldomly explored their relationship explicitly (with exception of few studies, as in Tavernaro, 2016), they nonetheless implicitly pointed towards a potential link between the two, as previously discussed. Moreover, the studies' qualitative insights of participants' listening experiences at times also drew links between being engaged with the music and conjuring up visual images in the mind. The nature of this relationship, however, should be investigated further. Chapter 1 pointed out affect as a potential common ground. According to Juslin's BRECVEMA theoretical framework (Juslin et al., 2010; 2013), visual imagery precedes an emotional response; this may, in turn, enhance the listener's engagement with the music. Alternatively, a certain degree of engagement is required

for visual imagery to be experienced. Nonetheless, the positive engagement–visual imagery relationship that emerged in this thesis presents promising groundwork for future research avenues.

7.1.2 Aim 2

Aim 2: To empirically investigate visual imagery in music listening through quantitative and qualitative explorations.

Both the quantitative and qualitative explorations in the two empirical studies provided interesting insights into visual imagery experiences. Continuous ratings, for instance, showed that music listeners may conjure up visual imagery across the entire duration of a piece, perhaps in the form of a narrative; or may experience imagery intermittently—for instance, interrupting a certain (imagined) narrative with no or contrasting imagery, before returning to it later in the piece. Durations of imagery experiences can vary greatly, and so the nature of their content, ranging from extremely vivid experiences to unidentifiable, abstract forms.

Existing studies qualitatively investigating visual imagery in music listening frequently focus on the content of the imagery conjured up. Küssner and Eerola (2017) brought the research a step further, identifying three types of imagery: realistic imagery, abstract imagery and absorbing imagery. The present research, however, intended to explore the possible *ways* in which visual imagery may emerge during music listening. A thematic analysis of participants' visual imagery annotations gave rise to nine broad 'visual imagery types'. These involved: *arbitrary; emotions; material abstractions; narratives; performance; personal recollections; pictorial associations; (idiosyncratic) sound associations; and (shared) musical topics*. Although these categories represent nine possible ways in which music listeners may experience visual imagery, they are, however, non-exclusive: visual imagery types may overlap, or involve a type of content that could fit with more than one category. This reflects the complexity of the imagery phenomenon. Just as past research suggests that different sensory modalities of imagery can occur, it may be added that different types of *visual imagery* can emerge in a listener's response to music. The visual imagery types' coding distribution has also been explored in relation to various factors, such as musical experience group or per piece. Whilst a number of similarities emerged across the two studies (for instance, a more frequent appearance of the *material abstraction* visual imagery type among the more musically experienced participants, than the less musically experienced), further research is required to refine and elucidate these visual imagery types.

7.1.3 Aim 3

Aim 3: To explore a selection of participants' individual differences in visual imagery and engagement responses, as well as the possible influence of programmatic information.

Participants' visual imagery and engagement responses during music listening were also explored in relation to a selection of individual differences: these involved musical experience, musical absorption, and one's propensity to use imagery in everyday life. Such explorations gave rise to intriguing areas which could be usefully explored in future research. Overall, although more musically experienced participants experienced statistically significantly higher levels of engagement, difference in visual imagery ratings were not significant between the more and less musically groups. As earlier mentioned, however, the greater variance in imagery responses may result in a less effective mean rating of the averaged continuous series, compared to engagement. Nonetheless, averaged visual imagery ratings correlated between them, suggesting that listeners who rate highly visual imagery in one piece, are also likely to provide high ratings of visual imagery in another piece. Particularly interesting was the way the two ANOVAs' factor 'piece' emerged as a significant within-subjects effect in Study 1's visual imagery and engagement ratings, but not in Study 2: both imagery and engagement ratings were not significantly different across pieces. This is in line with the stylistic variation of the music stimuli, which included different composers in Study 1, yet all works by Rachmaninov in Study 2. Surprisingly, no correlations emerged between visual imagery ratings and the *Spontaneous Use of Imagery Scale* (Reisberg, Pearson & Kosslyn, 2003). It may be possible that the visual imagery experienced during music listening is qualitatively different than the imagery used in everyday life, since studies suggest that music facilitates the experience of imagery (Quittner & Glueckauf, 1983; Band, 1996; Osborne, 1981)—an area which would benefit from further studies employing alternative imagery scales. Finally, liking ratings correlated with both engagement ratings and, on weaker levels, with most absorption ratings: this suggests that engagement with the music increases in line with its appreciation.

A further variable in the second empirical study explored the influence of extramusical information on participants' responses. Whilst, as predicted, this information could influence the content of listeners' visual imagery, this, however, was not always the case. Participants with no information about the pieces were nonetheless able to recognise some of the intended extramusical features through the music (such as birdsong or bells); by contrast, some of the listeners who were presented with the related extramusical information preferred to assign their own meaning to the music instead.

7.1.4 Aim 4

Aim 4: To explore, through a self-reflective account, personal visual imagery experiences during piano practice and performance sessions, investigating the ways in which these relate to the qualitative model which emerged from the empirical studies.

A self-reflective insight into the experiences of visual imagery as a performer supports the same visual imagery types (although some small adjustments are required to the model, as previously discussed). In particular, it emerged that performing from memory seems to place a particular emphasis on *performance* and *abstract*-related imagery. The way such imagery may appear for brief instances, but at specific moments in the piece, support other studies' memorization strategies (such as Ginsborg, 2004; and Kvifte, 2001). Moreover, the content of the visual imagery experienced whilst performing a particular piece of work, seem to consolidate the work's interpretation. No *arbitrary* or *personal recollection* types of imagery emerged in this self-reflective account. Perhaps, the performer's personal memories would emerge more easily if the work being performed holds an explicit affiliation to the performer's personal experiences; whilst, with regard to the *arbitrary* visual imagery type, it is likely that this was not captured as a result of its apparent irrelevance with the music being performed. Further research, however, is required before considering the generalizability of these findings.

7.2 Directions for Future Research

The findings of this research provided new insights into the experience of visual imagery and engagement in music listening, and supported a positive relationship between the two. The generalisability of these results is subject to the limitations discussed earlier in the thesis. Nonetheless, the data gathered, and its analysis, offered novel explorations of the phenomenon. Future research would benefit from further theoretical developments, particularly with regard to the nature of the engagement–visual imagery relationship. Investigations on the possible influence of specific musical features within a musical work also deserves further attention. Alternative experimental designs and methods should be scrutinized, such as the use of indirect measures alongside self-reported ones. In addition, a deeper look at the influence of culture, music listening habits, the use of specific sample groups and further investigations of music listeners' individual differences could produce interesting findings.

Overall, the limitations of this research leave abundant room for future investigations. Nevertheless, the findings which have emerged contribute towards an understanding of the mysterious, complex visual imagery phenomenon in music listening and its relationship with engagement.

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Appendix 1. Performance Portfolio Commentary

The performance material enclosed in the following portfolio captures a practical exploration and development of the PhD thesis's research theme: to investigate the role of visual imagery in piano works. The recordings selected reflect various stages and strands of this research exploration, beside the author's personal development as a performer. Whilst piano solo works form the core of this portfolio, recordings also include selections from the breadth of performance engagements, opportunities and projects that emerged in the course of the doctorate degree. The portfolio therefore includes accompanied and chamber works, a piano concerto and recorded premieres. All these performance scenarios contributed, in different ways, to the exploration of visual imagery and music.

The repertoire explored during the first year of this PhD initially focused on works by composers who frequently provided descriptive titles or programmatic references to their works. Such works varied from 'musical landscapes', as in Liszt's compositions (selections from *Années de Pèlerinage I: Suisse*), to more abstract references (such as Debussy's *Les Sons et les Parfums Tournent dans l'Air du Soir*). Liszt's transcription of Schumann's song *Widmung* for solo piano offered another approach to the topic, instigating a new, creative process of 'playing the words'. The inclusion of Mozart's A-Minor Sonata (KV.310) was initially intended to underline the possible contrast in the way musical repertoire may be presented—the difference between explicitly expressed programmatic references, versus more formal, structural titles. However, in turn, this comparison then gave rise to a new reflection: regardless of whether extramusical implications are explicitly expressed by a composer, however influential these may be, a listener may nonetheless engage with them differently, free to perceive and interpret the music by means of their personal experience

Similarly, as emerged from the two empirical studies in the thesis, visual imagery may be experienced in response to pieces with or without programmatic associations; and may or may not be related to the programmatic details, when provided (for example, a participant in Study 2 of this thesis, intentionally ignored the programmatic information being given, to enable a personal interpretative approach to the piece). Therefore, in relation to the arguments raised throughout the dissertation, the portfolio's strategy aimed to reconcile the dichotomy often created between so-called 'programmatic' and 'absolute' musical works (this is also briefly discussed in Chapter 1)—a distinction perhaps plausible if referring to a work's title or the extramusical information disclosed, but not in terms of listeners' perception of the musical work. Under this light, a later addition to the portfolio was Brahms' Op. 118. Musicological literature often emphasises in Brahms and his music a

renowned 'faithfulness to the idea of "absolute music"' (Taruskin, 2009:703). Yet, the work itself has no qualities that might otherwise prevent a listener from experiencing of visual imagery. Op. 118 carries a particularly intense emotional course; often deeply personal and intimate, as the A major *Intermezzo* (N.2), and at times tragically dramatic, as the *Dies Irae* themed *Intermezzo* (N.6). Interestingly, Brahms' Op. 118 is also central to Lidov's (2012) discussion on the use of musical topics in performance, inviting performers to reflect on the way topical contents of a work can shape the nuances of its performance: 'If the image comes to mind, the image will guide articulation. If the articulation is just right for that purpose (and there are multiple solutions, but each demanding its own precision) then the articulation can evoke a topical image' (p. 166).

Repertoire explorations throughout the second year include opportunities that enabled me to gain experience in a varied range of musical setting. One of these involved performing as the rehearsal soloist for Mozart's D Minor Piano Concerto with the Hull Philharmonic Orchestra; the orchestra was conducted by Andrew Penny, in preparation of their concert with pianist Richard Uttley. Whilst the opportunity emerged at short notice, as well as providing an extremely valuable experience as a pianist, the work offered an additional perspective to the research topic. The dramatic and operatic qualities of the work particularly lend themselves to imagery potentials; yet, the wide-ranging instrumentation raised suggestions for further research: the influence of the orchestra's rich timbral variation on visual imagery, for instance. A number of responses from the empirical studies conducted in this research presented varying degrees of sensitivity to the audio stimuli used for the experiments. For instance, the recording qualities would, at times, affect listeners' visual imagery (such as the subtle sounds of page turns). Similarly, the prominent changes in tone and sound effects created by different instruments, as well as their various combinations, could also act as a potentially influential factor for the imagery conjured up. The present research project focuses on piano works: both empirical studies maintain instrumental timbre a constant variable throughout. Nevertheless, such aspects of the music listening experience would be, indeed, worthy of further investigation.

The possible influence of varied instrumental combinations on visual imagery was also a consideration in the performance of chamber works. During the second academic year, the initiative to establish a new chamber ensemble led to the formation of NICE (New International Chamber Ensemble), a flexible collective which gathers local musicians of varying backgrounds and nationalities. As well as a range of concerts in local venues, the ensemble performed an evening recital as part of a concert series, the *Hornsea Music Society* in November 2016, and was subsequently invited to return in March 2017. Additionally, the society also presented me with the

opportunity to perform as a soloist at the opening concert of the society's 2017 season, following an invitation to play a shared evening solo recital with NICE's clarinettist Rae Todd (September 2017). Beside the variety of pianistic experiences gained from the dynamic chamber context, the collaborative process involved inspired a new research area from which imagery and music could be considered: the ensemble. The possible uses of visual imagery within the ensemble context do not lie within the scope of the empirical research of this thesis, although these are briefly acknowledged in Chapter 6. Nonetheless, initial elaborations on the way visual imagery could assist shared interpretative goals, creative teamwork and ensemble cohesion were discussed as part of two conference papers. These were presented at the *Piano Accompaniment Symposium* (University of Hull, 11-12 November 2016), and *RMA/BFE Research Students Conference* (Canterbury Christ Church University, 5-7 January 2017).

Portfolio material from the third PhD year was partly combined with a major project led by Dr. Lee Tsang, developed in conjunction with Hull City of Culture 2017: 'Ethel Leginska: The Musical Pioneer'. Leginska played a significant role in the music scene of her times, as a pianist, composer and conductor—not to mention her social contributions and achievements as a woman performer. Yet, it is only recently that her career and works have been drawn back from a surprisingly forgotten past. The project aimed at reviving the Hull-born pianist's life and 'forgotten works'. As the 2016–17 holder of the *Sinfonia UK Collective's* Graduate Placement Scheme, I actively collaborated in the performance side of the project, which gave rise to what is believed to be the recorded premiere of a selection of Leginska's works for solo piano, as well as for piano and voice (performed with Dr. Lee Tsang, baritone). The project not only created an original contribution towards promoting unknown and otherwise difficult to access repertoire, but also gave rise to a significant, imaginative process required in the interpretative decisions in performing these unfamiliar works. Imagery played an important role in this. Leginska's music frequently offers rich musical renditions of extramusical characters or ideas: the curious interplay between the piano accompaniment and the singer's words in *Six Nursery Rhymes*, for instance; the contrasting characters of the stone creatures portrayed in *The Gargoyles of Notre Dame*; or the Indian aura and hypnotic-like melodies captured in the *Scherzo after Tagore*. The project culminated in two sold-out afternoon performances (March 2017) in Hull's Ferens Art Gallery; both events were arranged as part of the WOW Festival (Woman of the World) and Hull City of Culture 2017's events programme. A further performance took place at the *International Conference of Musical Cultures* (University of Hull, April 2017). Selected works from these live performances were featured on BBC Radio 3 *Music Matters*, along with a short interview on Leginska's music with Dr. Lee Tsang and myself.

Appendix 2. Conference List

Aspects of this research have been presented as preliminary discussions at the following conferences:

Presicce, G. (2018). 'The Influence of Extramusical Information on Visual Imagery in Music Listening'. *KOSMOS Workshop*, Humboldt-Universität zu Berlin, Germany, May 2018.

Presicce, G. (2017).* 'Listening with the Mind's Eye: Visual Imagery in Music Listening'. *International Conference on The Image*, Venice International University, Venice, Italy, October-November 2017.

Presicce, G. (2017). 'Listening with the Mind's Eye: The Role of Visual Imagery in Music Listening'. *KOSMOS Dialogue*, Humboldt-Universität zu Berlin, Germany, June 2017.

Presicce, G. (2017). 'Exploring the Role of Engagement and Visual Imagery in Music Listening Cultures'. *International Conference on Musical Cultures/SEMPRE*, University of Hull, UK, April 2017.

Presicce, G. (2017). 'Listening with the Mind's Eye: Performers and Listeners' perspectives on Music and Visual Imagery'. *RMA/BFE Annual Research Students' Conference*, Canterbury Christ Church University, UK, January 2017.

Presicce, G. (2016). 'Imagery and Piano Accompaniment: Rehearsing with Instrumentalists'. *Piano Accompaniment in Practice Symposium*, University of Hull, UK, November 2016.

Presicce, G. (2015). 'In Search of Common Ground: Music Listening, Engagement and Visual Imagery'. *6th PhD Experience Conference*, University of Hull, UK, April 2015.

*Participation in this conference was enabled by the Emerging Scholar Award, an annual scheme which supports 'outstanding graduate students and emerging scholars who have an active academic interest in the conference area'.

Appendix 3. Questionnaires

The links below provide access to the questionnaires filled by participants in both Studies 1 and 2:

Goldsmiths Musical Sophistication Index (Gold-MSI) v1.0 (Müllensiefen et al., 2014):

https://www.gold.ac.uk/media/documents-by-section/departments/psychology/full_gmsi-1.pdf

Absorption in Music Scale (AIMS) (Sandstrom & Russo, 2013):

<https://psychlabs.ryerson.ca/content/uploads/sites/39/2015/05/AIMS3.pdf>

Spontaneous Use of Imagery Scale (SUIS) (Reisberg, Pearson & Kosslyn, 2003):

https://kosslynlab.fas.harvard.edu/files/kosslynlab/files/suis_020301.pdf

Appendix 4. Sample Question Sheet

PIECE N. ____

Please complete the questions below **AFTER** your **LISTENING TASKS (ENGAGEMENT)**

1. How familiar are you with the piece? (please circle)

Completely unfamiliar 1 2 3 4 5 6 7 Extremely familiar

2. How familiar are you with this style of music? (please circle)

Completely unfamiliar 1 2 3 4 5 6 7 Extremely familiar

3. Do you like this piece? (please circle)

Strongly disliked 1 2 3 4 5 6 7 Strongly liked

4. (*if applicable*) Have you played this piece before? (please circle)

Yes No I am not a musician / N.A.

PIECE N. ____ Please complete the questions below **AFTER** your **LISTENING TASKS (IMAGERY)**

5. Please feel free to make any annotations (written or drawn) to remind yourself of any imagery experienced whilst listening to this piece (*if applicable*).

6. What title would you give to this piece?

Appendix 5. Semi-Structured Interview Details

On completion of the first part of the study (questionnaires and listening tasks), participants were invited to discuss their listening experience through a face-to-face semi-structured interview. Each participant was audio recorded and interviewed individually. A graphic display illustrated the participant's visual imagery and engagement ratings alongside the rated music track; this was used as a trigger to reflect and discuss any visual imagery experienced, as well as their engagement levels with the music.

The general structure is outlined below. Further questions expanded on the topics emerged throughout the discussion.

1. **Do you have any form of synaesthesia?**
2. **How did you find the music?** (Are you familiar with classical music in general? Piano music?)

(Look at participant's ratings: high imagery points/high imagery and engagement levels or the "free drawing/annotations" box from the paper given). Play music back according to the points of interest.
3. **Expand on points of interest** in the data: e.g. can you describe your imagery at this point?
Can you describe what in the music triggered this image?
4. Was there any piece/part of a piece that you felt **engaged with the music, but in a negative way?**
5. How would you describe your **general experience with visual imagery and music?** E.g. Does it happen frequently or rarely? If experienced, are these images defined or abstract? Memories? Made up? Narratives?
6. **(If musician)** Is imagery something that emerged in your **musical education?** If yes, in what way?
7. Is there anything else you would like to share from your experience?

Appendix 6. Interview Transcript Sample

The text below is a transcription sample extracted from Gregory's face-to-face interview (Study 1).

Researcher: Before we start, do you have any form of synaesthesia?

Gregory: Ehm... no.

Researcher: And how did you find the music? Generally.

Gregory: I liked it quite a lot. Do you wanna know individually? I liked the first piece and the last piece most. And the second piece not so much, it's a bit annoying. A bit repetitive.

Researcher: Was there one of the four pieces that triggered more imagery?

Gregory: Well, yes. The one I liked least, actually. The devil... the diabolic piece. That was the most, obviously, visual piece.

Researcher: If we see what you rated... so the blue one [line] is your engagement, and the red is your imagery ratings.

Gregory: Aah!

Researcher: If I play back [the music], are you able to tell me what you were imagining at that point?

Gregory: Probably not.

Researcher: OK. Let me know if you do.

[Playing the opening bars of Prokofiev's *Suggestion Diabolique*]

Researcher: Was there anything in particular?

Gregory: Well, the low voice is like a daemon. Ehm... you know... that's all I see. And with the higher bits, it's like... confused. I often... when there's two voices, I see two different things and the interaction between them.

Researcher: That's interesting. And how do they appear in your mind? Do you visually see them or do you think of their relationship?

Gregory: It's hard to say, really. If I close my eyes, I can see things more. But I think because I'm looking to see something, then maybe I see things. But generally, I just... all the way through the piece I see... I don't see like a story or linear things, just images flashes. Like a dream almost. I just see, like, this daemon. But it's not consistent.

Researcher: You also mention in the very first piece, interactions between high and low voices.

Gregory: Yeah.

Researcher: Are you able to say something more on this?

Gregory: It's just an easy thing to catch onto, if there's quite a low voice and a very high voice. You just generally see... it's like bigger and smaller things, 'cause we associate... I think I associate a low voice with a bigger being, and a higher voice with a little floating thing. So... I think that's just an obvious thing.

Researcher: Thank you. You mentioned a bicycle in this piece.

Gregory: Yeah, because it sweeps up and down. I just imagined this daemon on a bicycle going down a very steep hill, and with his face very close to the handlebars. Grinning. [laughs]

(...)

[Playing Debussy's *Valse Romantique*]

Researcher: You have a very sharp peak in your imagery here, about to come.

[Music reaches bars 12–15]

Gregory: Yes, it was there really. Because of the sweeping arpeggios. To me, it looks like it could be lots of birds sweeping up and down starlings or swallows. And generally the piece... I think this sort of music has been used in Disney films in the past, when there's these nice pastoral scenes. I think that association as well, [word indistinct] can see these things. But especially with those sweeping arpeggios, that is quite obvious, for me.

(...)

Researcher: Now some general questions. How would you describe your general experience with visual imagery and music?

Gregory: Generally I don't tend to see things, because I think I just listen to the sounds. I think if there is an association, between the visual side and the sound, it's because of connotation. So, like, often in films there's a lot of obvious cliché things that have become part of our way of hearing music. And then I think sometimes if it's very distinctive, like those arpeggios, or the chromatic movement from the lizard [imagery], then an image does appear. But on the whole, not so much, it's just music, just sounds.

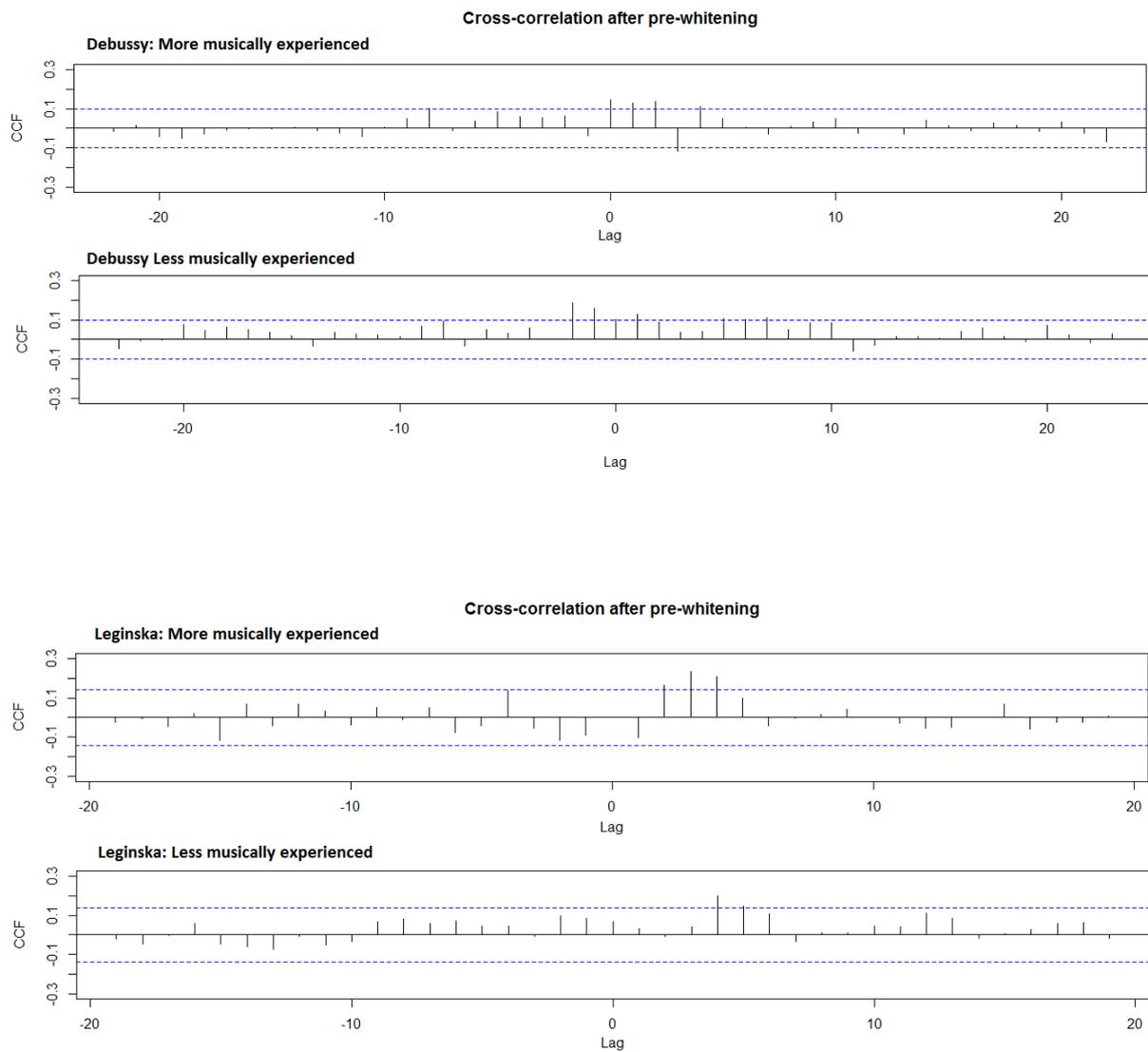
(...)

Researcher: Is imagery something that emerged in your music education at any point? For example, during your lessons?

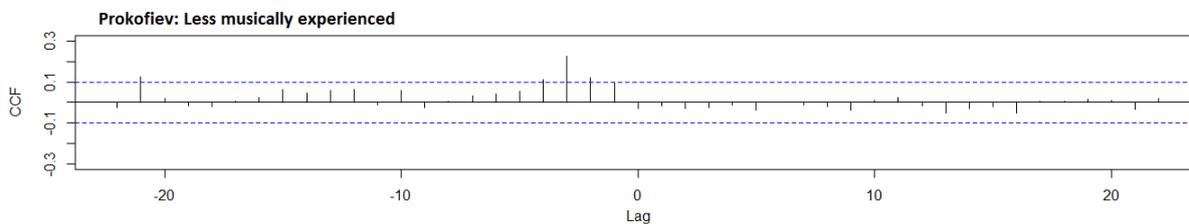
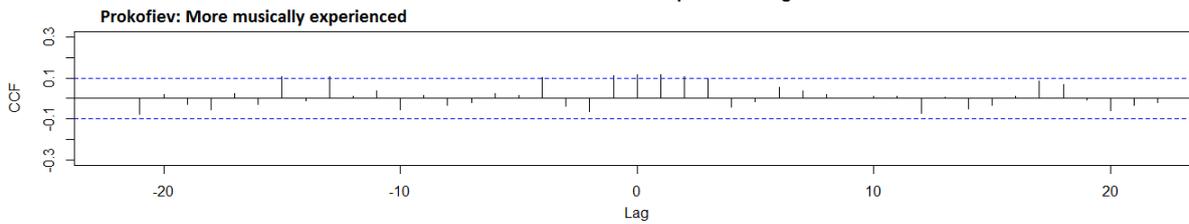
Gregory: There's actually, I was... ehm... I was in a guitar lesson, and in the practice room next door a saxophone quartet practicing. They were all out of time, and it wasn't very good but out of nowhere, there was this really high-pitched saxophone melody, and it was... he only got through halfway through and then came swoop down. It was really really... it was just so comical. And it was one of those moments that are quite rare in music, that just makes you laugh. And my guitar teacher just turned to me and said "did you see it? It was like a lizard!" [laughs]. A big drunken lizard. I think that's why I saw that in that other piece, but... I knew what he meant. I mean, maybe I didn't see it, until he mentioned it. But I knew exactly what he meant. So when it is so distinctive like that, maybe it triggers off visuals images. Because I think we are quite a visual species, and that most of the things we do require so much of our sight. But that was... yeah... it doesn't happen very often.

Appendix 7. Cross-Correlation Function Graphs (Study 1)

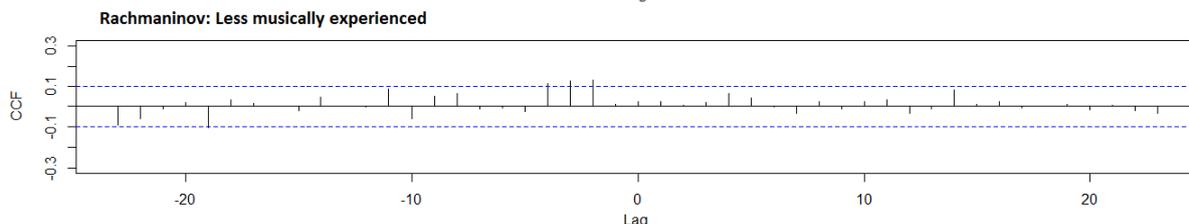
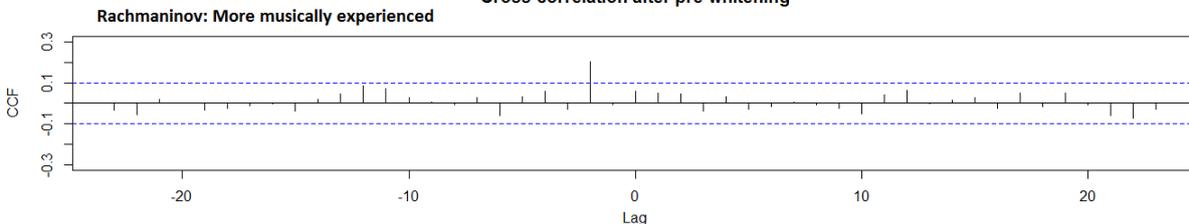
Cross correlation function graphs between pre-whitened engagement and visual imagery series for more/less musically experienced groups.



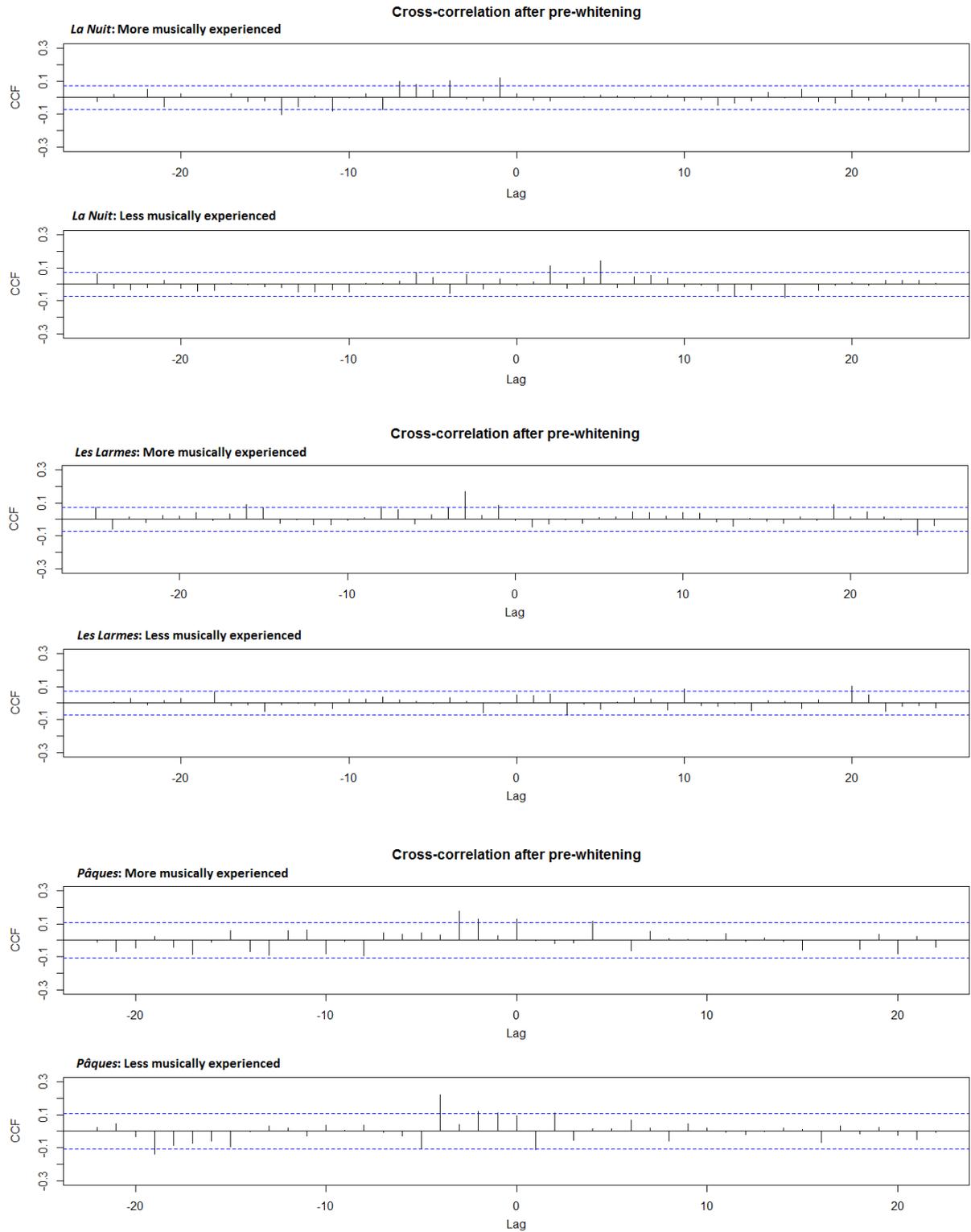
Cross-correlation after pre-whitening



Cross-correlation after pre-whitening



Appendix 8. Cross-Correlation Function Graphs (Study 2)



Appendix 9. Performers' Imagery Annotations

Free visual imagery annotations sample by the researcher (Piano I) and a second pianist (Piano II), during the private practice of Rachmaninov's Suite No. 1, *Fantaisie-Tableaux*, Op. 5.

Researcher's visual imagery annotations for *Pâques*:

*The opening theme played in high-pitched octaves brought to my mind small but resonant bells, as a call to Easter celebration. They are joyous and bright, yet not heavy in this opening (despite the *ff* marking, it feels like a different type of *ff*), hence I wanted to avoid an overly heavy touch where each single note is heavily emphasised. To obtain a resonant effect, I concentrated more on the down beat, thinking of the remaining notes almost echo behind it.*

A Russian native once explained to me that the actual translation of this piece's title (from the Russian) is not accurately described as "Easter", although it's close. It includes the idea of joy and light/bright. Since then, particularly in this opening, it often evokes the colour white, or a kind of light so bright that its colour is intense and luminous. When the theme returns, doubled by further octaves from the end of bar 8, these are larger bells: they have richer sonorities; hence, in my mind, the image and sound seem now on a larger scale. For this, the attack to the keys is from a greater distance, striking from above but still aiming for a sonorous sound rather than a harsh one (to this end, the hand strikes flat on the keys' surface with a fast attack, yet without overly "digging into the keys"). With the new melodic pattern in bar 21, some smaller bells join in, bringing energy and excitement in their smaller but more frequent movement. It may be that the way the quaver from the previous thematic pattern changes into a semiquaver creates this idea of a faster pace, even if the tempo remains the same.

The chordal theme starting at the end of bar 24 is vividly a church choir/choral song. The voice is low and deep, and I try to bring out the rich harmonies across the chords. I try to think of how the phrase would sound when sung, trying to shape it accordingly (e.g. rising dynamic the end of bar 28, and tailing off the second chord in bar 29). End of bar 31, larger bells come back, this time stronger, and increase their sound (I imagine their swinging from one side to the other) in bars 33-34.

From end of bar 38, the harmonies match the previous choral theme. Hence here my imagery fuses the two images of the bells and the choir. I try to keep these into account in my playing: bell sonorities, yet shaping the harmonies.

*The coda, from bar 45, is an intense building up. The bell theme is particularly strong in the inner notes marked *sf*. This is the strongest part of the piece. Imageries here are mixed and somehow hard to define at this point. It feels like there is a lot going on, and culminates this celebration of Easter, but above all the bells prevail—almost like emerging from a bird's eye view of a busy crowd celebrating.*

Second pianist's visual imagery annotations for *Pâques*:

b.1 Military leader giving a call to arms from a big stage

b.3 big bells

b.6 big gong heard across town

b.9 Big Chinese military parade

b.25 Big mountainous landscape

b.31 Bells

b.39 Grand archway into big city

b.53 people dancing a Cossack dance

b.55 dancing with sticks (like Morris Dancing)

Appendix 10. Performers' Visual Imagery (Video)

Video presenting the visual imagery reported by the researcher (Piano I) and a second pianist (Piano II) in response to Rachmaninov's *La Nuit... L'Amour*, from *Fantaisie-Tableaux*, Op. 5.

<https://www.youtube.com/watch?v=hogyHtvTdl8&feature=youtu.be>

Appendix 11. Performance Video

The researcher's memorised performance video of Poulenc's 'Caprice Italien', third movement from *Napoli Suite*.

<https://www.youtube.com/watch?v=r0YCzpRvhAU&feature=youtu.be>

Appendix 12. Performance Video

The researcher's memorised performance video of Janáček's *In the Mists*.

<https://www.youtube.com/watch?v=nicMYZyAS94&feature=youtu.be>