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Abstract

The present set of experiments investigated the role of emotion in false memory using a schema-based paradigm in which participants imagined familiar scenarios and rated words for their relevance to the scenarios. This was followed by tests of recognition memory that included words presented in the rating task, along with new words that were not presented but were semantically and emotionally related to the scenarios. Experiment 1 also investigated gender differences in susceptibility to false memories. In experiment 1, males (n = 35) and females (n = 58) imagined four scenarios, two of which were negative and two which were neutral. For each scenario, they were asked to rate the relevance of 15 words, of which 10 were related to the scenario and five were unrelated. They were then given a recognition test comprising 56 items (20 related targets, eight unrelated targets, 20 related lures, and eight unrelated lures). Correct recognition was higher for negative than for neutral words, but false recognition was higher for neutral than for negative words. There were no significant gender differences in correct or false recognition. Owing to the difficulties of recruiting male participants in experiment 1, experiment 2 investigated false memory in females only. We also extended the design to include positive as well as negative stimuli in order to gain a broader understanding of the effects of emotion on false memory. Participants (n = 42) studied two 15-item negative word lists and two 15-item positive word lists. Experiment 2 found no significant effects of emotion in correct recognition or in false recognition of related lures. However, a significant difference was found between unrelated negative and positive lures whereby participants falsely recognised more positive than negative unrelated lures. This is attributed to a positivity bias whereby participants are more likely to form an emotional 'gist' of positive than negative stimuli.

The effect of gender and emotion on schema-driven false memories.

The topic of gender differences in memory has amassed many studies looking at different types of memory (see Bloise & Johnson, 2007, for a review). Studies have revealed that females have superior memory compared to men for words (Herlitz et al., 1997; Kramer, et al., 1988), pictures (Herlitz et al., 1999; Galea & Kimura, 1993), names (West et al., 1992), and faces (Herlitz et al., 1997, Hill et al., 1995). Although these effects have been observed in emotionally neutral stimuli, gender differences are particularly prominent for emotional material, both in lab-based and naturalistic studies of memory. The aim of this thesis was to investigate whether there are gender differences in susceptibility to false memories, using both emotional and neutral stimuli in a lab-based study. Prior to this, I will review previous research into gender differences in memory, beginning with a discussion of autobiographical memory.

Autobiographical memory is the memory system containing "facts and events that have been interpreted and integrated into a consistent story about one's self" (Buckner & Fivush, 1998). A common method for assessing autobiographical memory is to look at autobiographical narratives, and in this context, compare them between males and females. Research suggests that males and females are not motivated to remember the same aspects of their autobiographical experiences (Buckner & Fivush, 1998). Females tend to show accessibility to their personal memories to a greater extent than males, with their recollections being more specific, longer and more detailed (Ross & Holmberg, 1990; Yarmey, 1993; deVries et al., 1995; Pillemer et al., 2003; Ely & Ryan, 2008; Wang, 2009; Ros et al., 2014). This difference between males and females can be seen in childhood. After giving children the Children's Self-View Questionnaire (CSVQ) to assess relations between gender, self-concept and autobiographical narratives, Buckner and Fivush (1998) found female children have longer autobiographical narratives which were more coherent and detailed compared to male children's narratives. Moreover, the narratives provided by the females were more concerned with relationships and within a social context, with more reference to people and emotions, compared to males (Buckner & Fivush, 1998). A number of authors have recognised that females exhibit an increased focus on social interactions, the role of significant others and relationships in past events (Merriam & Cross, 1982; Cowan & Davidson, 1984; Thorne, 1995). Additionally, another common theme across the literature is that males recall memories which are seen as separate and independent with a desire to be unique and de-identified from others (Oysterman & Markus, 1993; Huston, 1988; Tannen, 1994).

Later studies in this area provided similar results, with females showing a superior performance in autobiographical memory with an increase in empathy compared to males (Pohl et al., 2005). These authors tested individuals with an autobiographical memory questionnaire and two further tests on empathy and assertiveness, and in line with the literature, males scored higher in assertiveness and females scored higher in empathy. Several studies have emphasised that women's autobiographical memories include more emotion. However, along with an increased level of assertiveness, men also appear to have more active autobiographical memories (Friedman & Pines, 1991). When asked to describe their earliest gender-related childhood memories, Friedman and Pines (1991) found memories provided by males were significantly more active than those provided by females. The authors argue this can be interpreted as reflecting males being characteristically active and in a mode of "doing" which fits in with their sex-appropriate identification with their father. Also, the lack of emotion in males' memories can reflect their tendency to suppress their emotions (Friedman & Pines, 1991). Therefore, it could be argued that the motivation to remember specific aspects of autobiographical experiences may stem from gender stereotype roles, suggesting perhaps social factors also need to be considered when arguing a gender difference in memory.

Despite the argument for a gender difference in the literature for autobiographical memory, not at all studies share the same argument. Sotgiu (2019) found males and females reported meaningful experiences that were similar in content when asked to write personal narratives of life experiences which were meaningful and enabled participants to develop their best potential. Participants in this study also completed questionnaires assessing memory features of their reported experiences. The authors revealed there was no significant effect of gender on any memory characteristics, with further similarities in how males and females narrated and assessed their narratives (Sotgiu, 2019).

In addition to autobiographical memory, and many other forms of memory, research has also investigated gender differences in episodic memory. Episodic memory concerns the conscious recall of particular past personal experiences from an individual's own personal history (Tulving, 1972, see Conway, 2009, for a review). Episodic memory is often used interchangeably with autobiographical memory, however where episodic memory is argued to be part of autobiographical memory, it is more related to re-experiencing an event, whereas autobiographical memory is more associated with identity and an individual's own self (Conway, 2005). When administering episodic memory tasks to males and females, higher level performances from females are a common finding, especially when tested on recall.

When given the California Verbal Learning Test, Kramer et al., (1988) consistently found higher levels of immediate and delayed free recall in females. The authors argue this superior recall ability in females compared to males can be attributed to better retrieval which is also related to females' increased use of verbally mediated strategies. Further support for a female advantage in recall and additional episodic memory tasks comes from Herlitz et al., (1997). They consistently found females outperformed men on episodic memory tasks, with females having an increased performance level for face recognition, word recognition and recall, and given name recognition. It appears the superiority of females for performance in episodic memory tasks is consistent across different materials, and perhaps the suggestion of a higher verbal ability of females explains this superior performance in episodic memory tasks compared to men (Herlitz et al., 1997).

Despite many studies providing evidence for superior female performances in episodic memory, some also provide support for a male advantage, especially when it comes to visual tests. After using the Wechsler Memory Scale (WMS-IV) to assess auditory and visual episodic memory, as well as visual working memory, Pauls et al. (2013) found a higher-level performance from men on the visual episodic and visual working memory tasks. However, the authors also revealed females outperformed males on the auditory episodic memory tasks, which is consistent with the female advantage found in previous research.

Although there is a common theme of higher-level performances from females in episodic memory, Wang (2013) also revealed similar performances from men and women for forgetting functions, as well as supporting other studies showing a female advantage in additional episodic memory measures. After receiving a text message, participants were asked to record what had occurred during the thirty minutes prior to that text. This was carried out three times a day for one week. At the end of the week, participants were given a surprise memory test based on the events they had previously recorded. Consistent with previous research, females recorded more details than men, and also showed increased accuracy for the delayed recall task. Wang (2013) suggested this female advantage for remembering everyday episodic events could be specific to certain stages of remembering. For example, it may be that females show advanced encoding and retrieval. However, the author also argued that it is not necessarily the case that females have an advantage over males when retaining information over time due to both males and females revealing similar forgetting functions between the encoding and retrieval phases (Wang, 2013).

There is a considerable body of literature which shows that this gender difference in memory is more pronounced in emotional material. Generally, emotional memories are more

readily available to females than to males (Bauer et al., 2003). Females are found to report more vivid and emotional memories compared to men (Grysman & Hudson, 2013), which are also self-reported as more emotionally intense by females (Grysman et al., 2017). Additional support of a female advantage in emotional memory recall was also provided by Davis (1999), where the enhanced recall of females was specifically for autobiographical memories associated with emotion. However, studies in this area tend to use memory tasks administered in labs and clinics which lack content which is emotionally relevant to the participant (Davis, 1999). Whilst some studies do not provide details on which emotions females tend to report more, some reveal a bias in positive or negative memories alone. Ros and Latorre (2010) administered the Autobiographical Memory Test (AMT) and the Center for Epidemiological Studies-depression Scale (CES-D, Radloff, 1977) to subjects and revealed, compared to males, females remembered more negative memories. However, when remembering positive memories, there was no gender difference found. Furthermore, Boals (2010) reports that females are more likely to form an emotionally negative event as fundamental to their identity. It could be argued that, whilst females seem to have a superior memory for emotional events compared to males, the superior performance is mainly found with emotionally negative material. This makes sense as when we hear the term "emotional", we tend to associate this with negative emotion. Therefore, when the literature indicates a superior memory performance of females for "emotional" material, it is understandable to assume this is referring to negative emotions. Nevertheless, as mentioned previously, the vast majority of studies on this topic only refer to a gender difference in memory for "emotional" material with a greater memory performance in females.

Bloise and Johnson (2007) also showed a gender difference, however in their study the emotional content of the material to be remembered was controlled. When presented with scripts which included emotional and neutral information, Bloise and Johnson found females recall more emotional information compared to males, from scripts containing information that was both emotional and neutral. Also, when neutral information was highlighted as important, females had higher levels of recall for neutral information than males. This is plausible evidence that when neutral material is made salient, females' memory for that information will improve, even when mixed with emotional information, which females may normally find more salient (Bloise & Johnson, 2007). Even though a gender difference was found, Bloise and Johnson suggested the level of emotional sensitivity of an individual was a more powerful predictor of their emotional recall than was their gender. They argued that instead, memory for emotional information is not solely determined by gender but instead

demonstrates an individual's sensitivity to emotional information within their environment (Bloise & Johnson, 2007). However, gender differences for emotional memory seen in this study most probably reflect that, on average, females have increased sensitivity to the emotional aspects of their experiences and environment compared to men (Bloise & Johnson, 2007). This gender difference is also apparent in children. Buckner and Fivush (1998) gave children the Children's Self-View Questionnaire (CSVQ) and were asked to recall an experience which was associated with the nine self-concept dimensions the CSVQ assesses. As with adult populations, female children were more likely to mention emotions than male children.

Even though there are many studies which show a gender difference, some also give an explanation as to why this gender difference exists. When investigating differences in children, girls' increased use of emotion appears to be a result of the influence from their parents. Females are taught from an early age to assign attention to emotional events, and this results in complex and enriched representations of emotional experiences later in life (Boals, 2010). Mothers tend to be more elaborative and evaluative with their daughters compared to with their sons, and they also place emotional events in a more interpersonal context with their daughters (Fivush et al., 2003). Therefore, it may be that girls are forming a more elaborated and interpersonal emotional self-concept compared to boys (Fivush et al., 2003), which perhaps makes it easier for girls to readily express emotion and recall emotional memories. The bias in parents to refer to emotion with their daughters also goes back to 1995, where Adams et al. found parents' references to emotion were more frequent and varied with daughters, as well as more frequent mentions of sadness and disliking. By around 6 years of age, girls mentioned more unique emotional terms than did boys (Adams et al., 1995). Similarly, both Fivush et al. (2003) and Adams et al. (1995) argue, compared to males, females may be increasingly learning that important aspects of past experiences to discuss with others are emotions, and this is reflected in females' increased use of emotion when recalling past experiences.

As well as parental influence, it seems society may also be responsible for the gender difference. Emotion is an element that is certainly more salient in the socialization of females (Davis, 1999), and females are socialized into more expressive roles compared to males, with the expectation, as mentioned previously, to be emotional, selfless, and have strong interpersonal skills (Broverman et al., 1972). In Western societies, there is an emphasis on males to exert qualities such as independence, assertion, self-confidence, and dominance (Davis, 1999), and this, paired with the bias in how parents emotionally communicate with

their daughters and sons differently, may be the reason behind why females express and recall more emotional memories, as well as the different expectations of them emotionally compared to males. In today's society especially, there is the expectation of males to "man up" when expressing emotion, so it is not unreasonable to think this could be an additional explanation for the gender difference in emotional memory performance, although this is purely speculative.

Some authors have also struggled to provide this clear gender difference when considering specific emotions. After asking college students to recall the earliest experience they could remember, Dudycha and Dudycha (1933) found a much larger percentage of men recalled fearful experiences, whereas more women recalled experiences which angered them. These authors also revealed one third of females reported more joyful experiences, but feelings of shame and guilt appeared around three times as often in memories recalled by females than males. There were, however, no gender differences for the recall of memories including other emotions such as wonder and curiosity, sorrow and disappointment, and pain (Dudycha & Dudycha, 1933). Bauer et al., (2003) revealed, when writing accounts from early life, men and women did not differ in the frequency of emotional terms mentioned. However, when writing narratives about later life experiences, women increased their use of both positive and negative emotional terms, whereas men showed no increase. As a result, it seems gender differences emerge when recalling events that occurred later in life (Bauer et al., 2003). It is also argued that, although females express more emotion, it does not mean they experience more emotional events than males (Kring & Gordon, 1998). Kring and Gordon (1998) gave participants emotional films and questionnaires on experienced emotion and expressivity, amongst other things. They found women were more expressive but did not report experiencing more emotion than men. This is not surprising given what was previously mentioned regarding the different influences of society on males and females for expressing emotions.

Given the extensive evidence for gender differences in memory, some researchers have investigated whether there are also gender differences in false memory. A false memory is the incorrect recollection of an event, or parts of an event, but when recalling this event, a person believes they are accessing a real memory (Shaw, 2020). Perhaps the most popular method of investigating false recall is the Deese/Roediger-McDermott (DRM) paradigm (Deese, 1959; Roediger & McDermott, 1995). When participating in this paradigm, subjects are presented with word lists consisting of semantic associates of a "critical lure". The critical lure is not presented within these word lists. For example, participants study words such as

desk, cushion, couch, and bench, which are associates of the critical lure "chair". During a free recall task, participants are asked to recall the lists and any examples of falsely recalled critical lures are recorded. In a recognition test, participants are given a list of words which include both the studied words and critical lures. The number of studied words correctly recognised, along with the number of critical lures which are falsely recognised, are recorded. In these recall or recognition tests, participants often insist they have studied the critical lures. McDermott and Roediger (1998) also reveal that even when explicitly pre-warned about the nature of the induced false recognition effect, participants still falsely recognised 64% of the critical lures on a final recognition test.

The DRM paradigm has been victim to criticism, with the main critique being the lack of ecological validity. Gallo (2010) argues memories for word lists, like the DRM, are more artificial and less complex than autobiographical memories for many measures including personal relevance, emotional salience, social context, etc. Gallo claims it is these differences which limit any generalization from one situation to the other, as well as arguing that the finding showing generating DRM false memories is easy is not evidence that false autobiographical memories are common. Furthermore, the finding that more detailed perceptual DRM false memories are challenging to create is not evidence that detailed false autobiographical memories are rare (Gallo, 2010). The issue of generalization was also raised by Miller and Gazzaniga (1998) who insist the use of word lists are not as natural as, for example, pictures of everyday scenes and therefore the word lists are not so generalisable to other situations. Miller and Gazzaniga also criticise word lists as having to have numerous studied words to create quite a small number of critical lures. Therefore, they argue other paradigms need to be developed which produce false memories and are also practical to study in different laboratory settings (Miller & Gazzaniga, 1998).

As a result, Miller and Gazzaniga (1998) developed a picture paradigm where participants were presented with pictures of stereotypical scenes with some of the details from the scene removed and used as critical lures during an auditory recognition test. Participants' performance on the picture paradigm was compared to their performance on the classic DRM paradigm. The authors revealed participants reported almost seeing the critical lures in the picture paradigm as often as the studied items, and also showed that the picture paradigm is as successful as the word paradigm in creating false memories. Thus, the picture paradigm has increased ecological validity than the DRM paradigm because the memory falsifications were the result of inferences and expectations, perhaps based on prior

knowledge represented in schema form, as opposed to verbal associations (Miller & Gazzaniga, 1998).

When considering schemas, the basic assumption is that a person's previous experience will influence how they perceive, comprehend and remember new information (Brewer & Treyens, 1981). In a study by Brewers and Treyens (1981), they revealed subjects falsely remembered objects which were consistent with an office schema (e.g., a filing cabinet) following waiting in a graduate student's office, where those items had been removed. Dewhurst et al., (2019) also incorporated schemas and showed rating schema-related and schema-unrelated items in relation to a simulated event led to increased levels of false recognition compared to rating schema-related-and-unrelated items relating to a past event that participants remembered. They also demonstrated future thinking effects false memory and these effects extend beyond the classic DRM lists, with the use of schemas and simulating a future event.

Further alternative methods to the DRM have been used by Lampinen et al. (2000), where participants were presented with stories where the main character performed familiar activities. The stories included typical and atypical actions and participants were then presented with a recognition test containing both types of actions, half which were included in the story and half which were not included. Lampinen et al. found participants were more likely to correctly recognise the atypical actions than the typical actions, but they were more likely to falsely recognise the typical lure actions. The use of scripts has also been used as an alternative method. Dewhurst et al., (2008) argue when listening to a story, the activation of a script leads to distorted memory consistent with that script. They also suggest scripts are a substitute to word list paradigms for exploring distortions in memory which appear to look at the inferential processes that generate memory distortions outside of the laboratory, as opposed to verbal associations. It appears the production of false memories is not limited to words. Pesta et al., (2001) gave individuals multiplication problems followed by an immediate recall and/or recognition test for the multiplication problem answers. Many participants had false recollections of producing the multiplication lure as an answer, and to the authors' knowledge, this study was the first display of false memories where an individual incorrectly remembers executing a dynamic mental process (i.e., solving a multiplication problem for an answer) rather than demonstrating the more constant error of misremembering a presented word (Pesta et al., 2001).

A common concept within false memory literature is the fuzzy trace theory (Brainerd & Reyna, 1998) which states recalling information involves two traces: a verbatim trace and

a gist trace. A verbatim trace corresponds to the surface details of stimuli (Steffens & Mecklenbräuker, 2007), whereas a gist trace refers to the semantic, relational and elaborative properties of a stimulus (Schooler, 1998). The fuzzy trace theory predicts that false memories, under the appropriate experimental conditions, continue longer than true memories (Ceci & Bruck, 1998). Brainerd and Reyna (1998) also put forward the two types of traces are affected differently by numerous conditions. For example, verbatim traces are believed to decay quicker than gist traces, which over time results in an increased reliance on gist traces (Schooler, 1998). False memories are predominantly based on gist traces (Schooler, 1998). When explaining the DRM effect, it may be that participants remember the gist (i.e., the "theme") of the word list as opposed to the specific details (i.e., each individual words), and it is the participants' reliance on the gist which naturally leads to the false recognition of semantically related, but non-presented, words (Payne et al., 2002; Brainerd & Reyna, 1998). Steffens and Mecklenbräuker (2007) also argue that the probability of false memories increases if there is repetition of the gist, which occurs in the DRM, and also increases if memory declines after time has passed.

Numerous studies investigating false memory also reveal increased levels of false memory for emotional information, in particular emotionally negative information. In a study by Brainerd et al., (2008), they argued remembering DRM word lists which are negative in valence can trigger higher levels of false memory which considerably exceed false memories for emotionally neutral lists. In addition, participants in this study showed lower levels of false memory for emotionally positive items than for neutral items. Brainerd et al. (2008) suggest the familiarity of the semantic content of critical lures is amplified by negative valence, whereas positive valence has an opposing effect. The authors also argue that, relative to neutral valence, negative valence reduces individuals' ability to use verbatim traces to overpower any errors, whereas again positive valence has an opposing effect. In addition, they explain these results are due to participants forming emotional gist traces when studying the word lists which share the same emotional topic (Brainerd et al., 2008). Further research also reveals increased levels of false memory for negative material. El Sharkawy et al., (2008) also reported negative critical lures were more frequently falsely recognised compared to neutral critical lures. Also, for both negative and neutral critical lures, participants recognised those items more frequently than the negative and neutral word list items. In terms of correct recognition, this was greater for original items than for new items in each word list. The authors declare their findings show that the word lists were successful in creating false memories and subjects also learnt the lists (El Sharkawy et al., 2008).

Additional support for the higher levels of false memory for negative critical lures is provided by Howe et al., (2010). In their first experiment, during a recognition test, adults were more likely to falsely remember the negative critical lures compared to neutral ones. Adults were also more likely to falsely recognise weakly related, but not presented, negative items compared to neutral items. They propose that this may be due to the density of the emotionally negative lists and the associative networks which are highly developed in adults for negative information, and therefore false alarms appeared not only for the strongly activated items (i.e., the critical lures), but also for the weaker but related distractors. As a result, it is possible that the effects of emotion extend to even those items which are weakly related when recognition is the method used to measure false memory illusions and the role emotion plays (Howe et al., 2010). In Howe et al.'s second experiment, participants recalled neutral information better than emotional information, but the same effects emerged for false recall, where false recognition rates were either the same for neutral items or increased for emotional items (Howe et al., 2010).

Despite the evidence for negative items increasing false memory levels, not all studies within the literature support this. Budson et al., (2006) insist emotion has a minor impact on false recognition and no effect on item-specific recollection due to adults displaying greater correct recognition of emotional versus non-emotional items. One possible explanation the authors provide for these results is emotional critical lures are somewhat more distinctive than non-emotional critical lures, and as a result, participants are less likely to falsely alarm to distinctive items (Budson et al., 2006). Another possible explanation is related to the gist formed by participants. Budson et al. propose that if the gist of emotional word lists is stronger and/or wider than the gist of non-emotional words, individuals may be more likely to encounter familiarity or recollection when participating in the recognition test for emotional related and unrelated lures (Budson et al., 2006). However, due to their findings not revealing an increase in false recognition for emotional items, Budson et al.'s fuzzy trace explanation is unlikely to be correct. In a standard recall test with instructions to only recall what was studied, Palmer and Dodson (2009) revealed participants infrequently falsely recalled critical lures related to the emotional word lists compared to the neutral lists. In a further experiment, participants were instructed to recall the studied word list items and also items that were related to words they studied (i.e., critical lures). The results showed participants' recall for emotional critical lures was still less frequent compared to neutral critical lures. The authors propose the emotional critical lures are not as accessible and therefore less likely to come to mind than critical lures from neutral lists (Palmer & Dodson, 2009).

With regards to gender differences in false memory, the findings are mixed, with several studies failing to show a significant gender difference. Seamon et al., (2002) used the DRM paradigm but failed to find a gender difference in false recall. Bauste and Ferraro (2004) also investigated false memory in males and females using the DRM paradigm, and again no gender differences were found for the production of false memories. They argue that whilst the memory illusion of false memory is relatively strong, it does not seem to be affected by gender, even when different methods are used, and different control procedures are executed (Bauste & Ferraro, 2004). In another study supporting a non-significant gender difference in false memory, Kreiner et al., (2004) predicted females to have increased accuracy for recall of presented words due to the DRM paradigm measuring episodic memory for the presentation of specific words, and the tendency for females to outperform males on different measures of episodic memory. However, whilst using DRM word lists, each list was read out loud by either a male or female, and their results showed participants were equally as likely to show false word recall when words were presented in a voice which matched their own gender (Kreiner et al., 2004). Therefore, regarding gender, false memories are not consistently influenced by this factor, especially when using the DRM paradigm and regardless of whether word lists are read by participants themselves, or by read aloud by another gender-matched individual.

Several studies using the DRM paradigm have found a significant gender difference in false memory. Dewhurst et al., (2012) argued that perhaps using emotional DRM lists increases the likelihood of finding a significant gender difference. They gave participants emotionally negative and neutral word lists, and when given a recall task for the words in each list, females falsely recalled a higher number of negative lures compared to males. Yet, for the false recall of neutral lures, there was no significant gender difference. When explaining these findings in terms of the Activation Monitoring Theory (Roediger et al., 2001), their findings suggest females reflect on the associations within the emotionally negative word lists considerably more than males, and as a result females are more likely to produce the negative critical lures (Dewhurst et al., 2012). A further possible explanation for Dewhurst et al.'s findings, in relation to the fuzzy trace theory, is when females reflected on the emotionally negative word lists, this led them to encode the "emotional gist" more than males. This led the authors to argue that reflecting on the gist of emotional word lists will result in a selective increase in false recall, although not correct recall (Dewhurst et al., 2012). Another study by Sha'bani et al., (2019) revealed similar results. For the false recall of emotionally negative critical lures, a significant gender difference was found with females

showing higher levels of false recall than males. This significant gender difference was evident in the overall levels of both false and correct recall (Sha'bani et al., 2019).

In a recent study using an alternative method to the DRM paradigm, Johannsdottir et al., (2021) showed individuals two video clips of a neutral and emotional scenario and followed with two interviews, a week apart, asking both true and false questions about the events they witnessed in the video. Their findings revealed females were just as likely to falsify as men did, but females were actually more likely to view their fabrication as true, especially for the emotional video. Johannsdottir et al. (2021) put forward when misinformation is self-generated, emotionally negative events increase an individual's likelihood to fabricate, however, they do not lead to increased recognition of these fabrications as true a while later compared to neutral events. So overall, the superior performance of females on different episodic memory tasks, as mentioned earlier, does not appear to influence their likelihood to fabricate, but it does increase females' recognition of their false responses compared to males, especially for emotional events (Johannsdottir et al., 2021).

Gender stereotypes have also been shown to influence false memory, using both the DRM paradigm and alternative methods. Lenton et al., (2001) argue an advantage of exploring the influence of gender stereotypes using the DRM paradigm is it allows researchers to look into false memories for direct associations in memory (e.g., bed and sleep) and also for indirect associations in memory (e.g., nurse and model). For the example "nurse and model", despite not being linked directly in memory, they are associated with the concept of a female (Lenton et al., 2001). This was the first study to illustrate that false memories can be produced by indirect stereotype associations using the DRM procedure by showing individuals were more likely to falsely remember a non-presented word which was stereotypically in line with the list they studied compared to a non-presented word which was inconsistent with the stereotypes (Lenton et al., 2001). Another study to look at the influence of gender stereotypes was by deMayo and Diliberto (2003); however they employed a novel picture paradigm which was based on the DRM paradigm and was argued to be a more realistic method compared to the use of words. After showing pictures of a man or woman performing stereotypical male-related and female-related household chores, they found a reliable false memory effect for the critical lure pictures. This effect was larger for those pictures which portrayed a stereotypical female chore as opposed to a stereotypical male chore (deMayo & Diliberto, 2003).

There was clear evidence found from Dewhurst et al. (2012) that females are more susceptible than males to false memories of emotional material. However, as discussed previously, a limitation of the DRM paradigm is that it lacks ecological validity. Therefore, the aim of the current study is to investigate gender differences in false memories using more ecologically valid stimuli. In order to achieve this, this study extended a paradigm originally developed by Dewhurst et al. (2019). Dewhurst et al. asked participants to imagine familiar scenarios (e.g., going on holiday) and then to rate a series of object nouns for how likely they were to be encountered within the scenarios. Some of the more typical items (e.g., suitcase) were omitted from the rating task but were then included as 'critical lures' in a recognition test, along with words that were included in the rating task. Dewhurst et al. (2019) found this procedure produced high levels of false recognition for words that were relevant to the scenario but were not presented during the rating task (i.e., related critical lures). However, their main focus was on the effects of temporal direction, whereby participants were asked to imagine past events, future events, or typical events. The current study did not include a manipulation of temporal direction but instead extended this procedure to investigate the relationship between false memory, emotion, and gender.

Participants in the current study were asked to imagine four familiar scenarios, two being emotionally neutral (e.g., a train ride and a trip to the supermarket), and two being emotionally negative (e.g., going to the hospital and taking an exam). After being presented with a word list after imagining each scenario, participants rated a series of words for how relevant they were to that scenario. They were then given a surprise recognition test for the words they had previously rated, which also contained the critical lures for each scenario. In Experiment 2, a new group of participants imagined two emotionally negative scenarios (e.g., going to the hospital and taking an exam) and two emotionally positive scenarios (e.g., going on holiday and going for a picnic).

Given that previous studies have found increased levels of false memory for emotionally negative material (e.g., Brainerd et al., 2008; Howe et al., 2010), despite those authors using the DRM, it was predicted that in this study there would be higher levels of false memory for the negative scenarios, with females falsely recognising more negative critical lures compared to males for experiment one. In addition, based on studies by Dewhurst et al. (2012) and Sha'bani et al. (2019), for experiment two it was predicted females would falsely recognise more negative critical lures compared to positive critical lures.

Experiment 1

Method

Participants. Ninety-three students (35 males and 58 females in the age range 18-53 years) from the University of Hull, UK, participated in the experiment. All female participants were undergraduate students from the Department of Psychology, and male participants were a mixture of undergraduate students from the Department of Psychology and postgraduate students from across the University of Hull as a whole. Participants were tested in research labs at individual workstations, in groups of between one and three. Students from the Department of Psychology received course credit for their participation. Those who were postgraduate students received a £5 Amazon voucher as payment for their participation. Not all participants were native English speakers, however, all international students studying at the University of Hull are required to pass English proficiency tests prior to their arrival, therefore this was not considered an issue for this experiment. Furthermore, due to the nature of the tasks and stimuli being visually presented, participants were required to have normal or corrected vision.

Ethical considerations. This study was granted ethical approval by the Psychology Ethics Committee at the University of Hull, following an 'Ethics Form' submission (Appendix A). A risk assessment form (Appendix B) and data management plan (Appendix C) was submitted as part of this process. A few changes were then made to the instructions given to participants during the experiment. These were also approved by the Psychology Ethics Committee, following the submission of a 'Notice of Substantial Amendment' form (Appendix D). An informed consent form (Appendix E) was signed by all participants after reading the information sheet (Appendix F), and at the end of the study session all participants were provided with the debrief sheet (Appendix G). The debrief sheet included relevant sources of support for participants including the Samaritans, Shout and the Hull University Student Assistance Programme. These were provided due to the stimuli having the potential to trigger negative thoughts. Participants were given the opportunity to withdraw from the study at any point up until submission of their data, after which their data would be anonymised and unable to be withdrawn. Participants were informed of this in the information sheet as well as the debrief sheet. The aim of the study was not revealed to participants until they completed the study and were given the debrief sheet. This was necessary to ensure participants would focus on the rating task as opposed to attempting to memorise each word using another strategy. The data was completely anonymous meaning

the researcher was not able to associate answers with specific participants. Contact details for the researcher, supervisor and Psychology Ethics Committee were also provided in the debrief sheet.

Stimuli. Four schema-based scenarios, similar to those used by Dewhurst et al. (2019), were presented to participants. Two of these scenarios were emotionally neutral: a train ride and a trip to the supermarket, and two scenarios were emotionally negative: going to the hospital and taking an exam. Although based on those used by Dewhurst et al., the scenarios were created for the current study by the researcher and supervisor. The four scenarios are presented below:

Train ride. *Imagine that you are about to go on a train journey. Imagine how the train will look. Think about the things you might see, the people you might meet, the passing scenery, and so on. Please spend a few moments imagining this train journey. While you are imagining this experience, I am going to present you with a list of words describing objects and people. I would like you to rate how likely it is that each of these items would be on the train journey. For some items, it may be very likely that they will be there. For others, it may be unlikely. It is up to you to decide.*

Trip to the supermarket*. Imagine that you are about to go to the supermarket. Imagine how the supermarket will look. Think about the items you might buy, the people you might see, how the supermarket is laid out, and so on. Please spend a few moments imagining this trip to the supermarket. While you are imagining this experience, I am going to present you with a list of words describing objects and people. I would like you to rate how likely it is that each of these items will be at the supermarket. For some items, it may be very likely that they will be there. For others, it may be unlikely. It is up to you to decide.*

Going to hospital. *Imagine that you are about to spend some time in hospital. Imagine that you feel very worried about this. Think about the discomfort you might experience, how lonely you might feel, the boredom, and so on. Please spend a few moments imagining your time in hospital. While you are imagining this experience, I am going to present you with a list of words describing objects and people. I would like you to rate how likely it is that these items would be in the hospital. For some objects, it may be very likely that they would be there. For others, it may be unlikely. It's up to you to decide.*

Taking an exam. *Imagine that you are about to take an exam for which you feel completely unprepared. Think about how nervous you would be, the worry that you might have revised the wrong topics, the importance of doing well, and so on. Please spend a few moments imagining this exam. While you are imagining this experience, I am going to*

present you with a list of words describing objects and people. I would like you to rate how likely it is that these items would be at the exam. For some objects, it may be very likely that they would be there. For others, it may be unlikely. It's up to you to decide.

For the rating task, four 15-item word lists were provided, with one list per scenario. Each word list consisted of ten words related to the scenario and five unrelated words. In Dewhurst et al.'s study included an equal number of related and unrelated words for each scenario, however in the current study, the number of unrelated words were reduced to five in order to make the task more manageable, especially since the current study includes more scenarios than the study by Dewhurst et al. (2019). Furthermore, this study is primarily interested in the effects of Gender and Valence on false memory for related words, therefore, a lower number of unrelated words is not so much of an issue here. The distractor task was a number wordsearch (Appendix H) with 29 number sequences to find.

The recognition test consisted of a total of 56 items (14 items for each scenario). For each scenario, the recognition test included five related and two unrelated targets, as well as five related and two unrelated lures. Targets were items that were present in the rating task (i.e., participants did see these words). Lures were words that were not included in the rating task (i.e., participants did not see those words). Every scenario had related lures, which were words that were related to the scenario but not included in the rating task. The related lures for each scenario are shown in Table 1. Altogether, participants saw 20 related targets, eight unrelated targets, 20 related lures, and eight unrelated lures. The test items were presented in a different random order for each participant. The full set of stimuli for the rating task can be seen in Appendix I, and the full set of stimuli for the recognition test can be seen in Appendix J.

Table 1. *Related lures presented in the recognition test for each emotionally negative and emotionally neutral scenario.*

Related lures			
Negative		*Neutral*	
Hospital	*Exam*	*Train ride*	*Supermarket*
Bed	Desk	Carriage	Bakery
Gown	Exam paper	Guard	Checkout
Nurses	Pencil case	Passengers	Freezers
Painkillers	Seat number	Platform	Shoppers
Surgeon	Students	Timetable	Trolley

Patient Health Questionnaire (PHQ-8). The PHQ-8 (Appendix K) was used to measure participants' mood. This is a questionnaire consisting of eight statements which presented different problems with mood (e.g., "Little interest or pleasure in doing things"). Participants had four options to choose from to indicate how often they have been bothered by these problems over that past two weeks (e.g., not at all, several days, more than half the days, and nearly every day). All stimuli were presented on Qualtrics software.

Procedure. All experimental materials, including the PHQ-8, were administered using Qualtrics experimental generator software (Qualtrics, Provo, UT). After providing informed consent, participants were presented with the PHQ-8, where they were told they would be asked questions about their mood over the past two weeks. They were then told the purpose of the study was to examine how people think about words in relation to negative and neutral scenarios. This procedure is known as incidental learning, due to no mention of the recognition test, and because this procedure involves unintentional learning of words. Instructions for the rating task were developed by Dewhurst et al. (2019).

The rating task was self-paced. The 15-items (10 related and 5 unrelated) were presented one at a time on a computer screen and participants rated the likelihood of encountering that item on a 10-point rating scale, from 0 = not at all likely to 10 = extremely likely, by using the computer mouse to select the appropriate number. The order of scenarios presented differed for each participant. After completion of the rating task for the remaining three scenarios, participants engaged in a non-verbal distractor task for ten minutes. This was a number wordsearch. Participants were then given a surprise recognition test. This was also

self-paced and included studied and unstudied words from each scenario in the previous rating task being presented one at a time on the computer screen. The instructions given to participants were:

You will now see another list of words. Your task is to decide whether each word appeared in one of the rating tasks you have just completed. If you recognise the word from one of the rating tasks, please select ***Yes****. If you believe the word did not appear in one of the rating tasks, please select* ***No****.*

Results/Discussion

Data consisted of study ratings, numbers of correctly recognised related and unrelated words, and numbers of falsely recognised related and unrelated words, as a function of gender and valence, and also scores on the PHQ-8. The means for these can be seen in Table 3. Study ratings were analysed in a 2 (Gender: male versus female) x 2 (Valence: negative versus neutral) x 2 (Relatedness: related versus unrelated) mixed ANOVA with repeated measures on the second and third factors. Scores for correct and false recognition were analysed in separate 2 (Gender: male versus female) x 2 (Valence: negative versus neutral) mixed ANOVA with repeated measures on the second factor.

Table 3. *Means for correct recognition of related and unrelated words, false recognition of related and unrelated lures, and study ratings for related and unrelated words.*

	Males		*Females*	
	Negative	*Neutral*	*Negative*	*Neutral*
Correct recognition – Related	9.83 (.45)	9.66 (.87)	9.84(.41)	9.57 (.75)
Correct recognition – Unrelated	3.94 (.24)	3.83 (.57)	3.86 (.35)	3.88 (.38)
False recognition – Related	.57 (.82)	1.11 (1.13)	.76 (1.10)	1.43 (1.46)
False recognition – Unrelated	.17 (.38)	.03 (.17)	.21 (.59)	.21 (.59)
Study ratings – Related	8.04 (.90)	7.87 (1.05)	8.35 (.86)	7.9 (1.21)
Study ratings - Unrelated	1.06 (.83)	2.55 (1.06)	.96 (.80)	2.27 (1.09)

In the analysis of study ratings, there was no main effect of gender, $F < 1$. The main effect of valence was significant, F (1,91) = 40.187, MSE = .627, $p < .001$, η_p^2 = .306, where ratings for neutral words (5.14) were higher than ratings for negative words (4.60); in other words, neutral items were rated as more relevant than negative items. The interaction between valence and gender was not significant, F (1,91) = 2.058, MSE = .627, p = .155, η_p^2 = .022. The main effect of relatedness was significant, F (1,91) = 3079.475, MSE = 1.133, $p <$ .001, η_p^2 = .971, whereby ratings were higher for related items (8.03) than for unrelated items (1.71). There was no significant interaction between relatedness and gender, F (1,91) = 2.246, MSE = 1.133, p = .137, η_p^2 = .024. However, there was a significant interaction between valence and relatedness, F (1,91) = 227.034, MSE = .288, $p < .001$, η_p^2 = .714, where ratings were higher for related negative words (8.20) and related neutral words (7.87), than for

unrelated negative words (1.01) and unrelated neutral words (2.41). This means for the negative words, the related words were rated as more related, and unrelated words were rated as less related, compared to the corresponding neutral items. The interaction between valence, relatedness and gender was not significant, $F < 1$.

In the analysis of correct recognition for related words, the main effect of gender was not significant, $F < 1$. There was a significant main effect of valence, F (1,91) = 7.860, *MSE*, .278, $p = .006$, $\eta_p^2 = .08$, whereby correct recognition scores for related negative words (9.84) were higher than correct recognition scores for related neutral words (9.61). The interaction between valence and gender was not significant, $F < 1$. For the correct recognition of unrelated words, the main effects of gender and valence were not significant, $F < 1$. The interaction between gender and valence was not significant, F (1,91) = 1.401, *MSE* = .135, $p = .240$, $\eta_p^2 = .015$. For correct recognition, there appears to be a ceiling effect where the majority of participants scored at or close to the maximum score. With the exception of the effect of valence on the related words, the ceiling effects preclude a significant difference.

In the analysis of false recognition of related lures, the main effect of gender was not significant, F (1,91) = 1.285, *MSE* = 2.156, $p = .260$, $\eta_p^2 = .014$. The main effect of valence was significant, F (1,91) = 24.152, *MSE* = .667, $p < .001$, $\eta_p^2 = .210$, where false recognition levels were higher for neutral related lures (1.27) than for negative related lures (.67). The interaction between gender and valence was not significant, $F < 1$. For the analysis of false recognition of unrelated lures, again there was no significant main effect of gender, F (1,91) = 1.085, *MSE* =.460, $p = .300$, $\eta_p^2 = .012$. The main effect of valence was significant, F (1,91) = 6.449, *MSE* = .035, $p = .013$, $\eta_p^2 = .066$. In contrast to related lures, false recognition levels were higher for negative unrelated lures (.19) than for neutral unrelated lures (.12). Also, the interaction between gender and valence was significant, F (1,91) = 6.449, *MSE* = .035, $p = .013$, $\eta_p^2 = .066$. For female participants, there was no significant effect of valence, $p = 1$, however, for male participants, they showed significantly higher levels of false recognition for negative items than for neutral items, $p = .002$.

The relationship between PHQ-8 scores and correct and false recognition were analysed using Pearson's *R* correlation, with separate analyses for males and females. Data for the correlations can be seen in Appendix L. For male participants, PHQ-8 scores did not correlate with either correct or false recognition. For female participants, there was a significant negative correlation between PHQ-8 scores and the correct recognition of negative related words, $R = -.348$, $p = .007$.

It was hypothesised that, compared to males, females would produce higher levels of false memory for negative lures as opposed to neutral lures, however, the results of experiment 1 have failed to support this hypothesis due to no significant main effect of gender, as well as the significant interaction between gender and valence revealing males falsely recognised negative items than neutral items significantly more than females. For related lures, there were higher levels of false recognition for neutral lures which does not support the hypothesis of higher levels of false recognition for negative items. Although, for unrelated lures, negative items were falsely recognised more than neutral items, with males showing significantly higher levels of this false recognition.

Supporting previous research (Seamon et al., 2002; Bauste & Ferraro, 2004; Kreiner et al., 2004), there was no gender difference in false recognition for both related and unrelated negative and neutral lures in Experiment 1. False recognition scores were affected by valence for related words, with higher false recognition for neutral related words than negative related words, which does not support previous research (Brainerd et al., 2008; El Sharkawy et al., 2008; Howe et al., 2010). valence also affected false recognition for unrelated words with higher false recognition scores for negative unrelated words than for neutral unrelated words. Despite no gender difference for Experiment 1, the significant interaction between gender and valence revealed males had higher levels of false memory for negative items, but false memory levels for females were not affected by valence. This did not support the hypothesis that females would falsely recognise more negative lures than males, as well as not supporting the hypothesis that higher levels of false memory would be produced for related negative lures.

For the analysis of study ratings for negative words, the related words were rated as more related, whereas the unrelated words rated as less related, compared to the neutral items. One possible explanation for this finding is that the negative items have an extra dimension of emotion which is not present with the neutral items. Therefore, those items which match the emotional valence of a scenario may be rated as more related, although this is speculative.

In terms of the relationship between PHQ-8 scores and correct recognition, the finding of a significant negative correlation between PHQ-8 scores and correct recognition of negative related words indicates the more depressive symptoms participants show, the fewer negative words they correctly recognised. Previous research has shown depressive symptoms are associated with a bias towards negative items, but this experiment found the opposite, with a bias towards neutral items instead. One possible explanation for this is that participants

with high PHQ-8 scores were also high in cognitive avoidance, however without an actual measure of cognitive avoidance, such as the Cognitive Avoidance Questionnaire (Sexton & Dugas, 2008), this cannot be confirmed.

The main finding of experiment 1 was a significant effect of emotion on false recognition, whereby false recognition was lower for negative than for neutral lists. The aim of experiment 2 was to further explore the effect of emotion on false memory by including positive stimuli as well as negative. Owing to the difficulty of recruiting sufficient numbers of male participants for experiment 1, the decision was made to focus on the effects of positive and negative emotion on female participants. Previous research has shown that females are more susceptible than males to emotional false memories, albeit only with negative stimuli. It was felt, therefore, that any effects of emotion with the schema-based paradigm are more likely to emerge in female participants.

Experiment 2

Method

Participants. A new group of 42 female students (age range 18-39 years) from the University of Hull, UK, participated in the experiment. All participants were undergraduate students from the Department of Psychology. Students were tested in groups of between one and three, at individual workstations, within research labs. All participants received course credit for their participation in the experiment. As with the previous experiment, not all participants were native English speakers, however, due to the University of Hull's requirement for international students to pass English proficiency tests prior to their arrival, this was not a problem for this experiment. In addition, participants were required to have normal or corrected vision due to the nature of the tasks and stimuli being visually presented.

Ethical considerations. This experiment followed the same format as experiment 1, however a few changes were made to the stimuli (i.e., scenarios were now positive and negative as opposed to negative and neutral included in experiment 1). These changes were approved by the Psychology Ethics Committee at the University of Hull, following a 'Notice of Substantial Amendment' form submission (Appendix M). As with experiment 1, an informed consent form (Appendix E) was given to all participants to sign after receiving the information sheet (Appendix N). After completing the study, participants were also given a debrief sheet (Appendix O) which included contacts of support such as the Samaritans, Shout and the Hull University Student Assistance Programme. These were provided due to the nature of the negative stimuli and the potential to trigger negative thoughts. Participants were

given the right to withdraw at any point during the study up until submission, where their data would be anonymised, and the researcher would be unable to be link any answers back to them. This was explained in the information sheet and the debrief sheet. Similar to experiment 1, the aim of the study was not revealed to participants until they received the debrief sheet after completion of the experiment. This was to ensure participants would focus on the rating task and not try to memorise the words using another strategy. Within the debrief sheet, contact details were provided for the researcher, supervisor and Psychology Ethics Committee.

Stimuli. Four schema-based scenarios, based on those used by Dewhurst et al. (2019), were presented to participants. Two of these scenarios were the emotionally negative scenarios used in experiment 1 (going to the hospital and taking an exam). Two emotionally positive scenarios (going for a picnic and going on holiday) were created by the researcher and supervisor. The two positive scenarios are presented below:

Going for a picnic. *Imagine that you are about to go on a picnic. Imagine how enjoyable this would be. Think about the nice food you might eat, the games you might play, the beautiful scenery, and so on. Please spend a few moments imagining this picnic. While you are imagining this experience, I am going to present you with a list of words describing objects and people. I would like you to rate how likely it is that each of the items would be at the picnic. For some items, it may be very likely that they would be there. For others, it may be unlikely. It's up to you to decide.*

Going on holiday. *Imagine that you are about to go on a beach holiday abroad. Think about how excited you feel as you're packing for the holiday. Imagine yourself going sightseeing, swimming in the pool, relaxing on the beach, and so on. Please spend a few moments imagining this holiday. While you are imagining this experience, I am going to present you with a list of words describing objects and people. I would like you to rate how likely it is that each of these items will be at the holiday. For some items, it may be very likely that they will be there. For others, it may be unlikely. It is up to you to decide.*

For the rating task, four 15-item word lists were provided, with one list per scenario. Each word list comprised of ten words related to the scenario and five words unrelated. As in Experiment 1, the number of unrelated words was reduced to five to make the task more manageable and because this study is interested in related words, despite Dewhurst et al. (2019) including ten unrelated words in their study. The distractor task was a number wordsearch (Appendix H) with 29 number sequences to find.

The recognition test was comprised of 56 items (14 items for each scenario). Each scenario had five related and two unrelated targets, as well as five related and two unrelated lures, as test items. Altogether, participants saw 20 related targets, eight unrelated targets, 20 related lures, and eight unrelated lures. The related lures for each scenario are shown in Table 2. The full set of stimuli for the rating task can be seen in Appendix P and the full set of stimuli for the recognition test can be seen in Appendix Q.

Table 2. *Related lures presented in the recognition test for each emotionally negative and emotionally positive scenario.*

Related lures			
Negative		*Positive*	
Hospital	*Exam*	*Picnic*	*Holiday*
Bed	Desk	Blanket	Currency
Gown	Exam paper	Drinks	Passport
Nurses	Pencil case	Hamper	Suitcase
Painkillers	Seat number	Napkins	Swimwear
Surgeon	Students	Sandwiches	Tourists

Patient Health Questionnaire (PHQ-8). The PHQ-8 (Appendix K)

was also used for this experiment, in order to measure the mood of participants. This questionnaire consisted of eight statements presenting different problems with mood (e.g., "Feeling down, depressed, irritable or hopeless). Participants had four options to choose from to indicate how often they have been bothered by these problems over the past two weeks (e.g., not at all, several days, more than half the days, and nearly every day). All stimuli were presented on Qualtrics software.

Procedure. All experimental materials, including the PHQ(8), were administered using Qualtrics experimental generator software (Qualtrics, Provo, UT). The PHQ-8 was presented to participants, where they were told they would be asked questions about their mood over the past two weeks. They were then informed of the purpose of the study, which was to examine how people think about words in relation to negative and positive scenarios. As in experiment 1, an incidental learning procedure was followed whereby participants were

not informed in advance that their memory for the words would be tested. Instructions for the rating task were developed by Dewhurst et al. (2019).

The rating task was self-paced. The 15-items (10 related and 5 unrelated) were presented on a computer screen one at a time, and participants rated the likelihood of encountering that item on a 10-point rating scale, from 0 = not at all likely to 10 = extremely likely. Participants did this by using the computer mouse to select the appropriate number. After completing the rating task for the remaining three scenarios, participants engaged in a non-verbal distractor task for ten minutes, where they were presented with a number wordsearch. Participants were then presented with a surprise recognition test. This was also self-paced and included studied and unstudied words from each scenario in the previous rating task being presented one at a time on the computer screen. Participants were given the following instructions:

You will now see another list of words. Your task is to decide whether each word appeared in one of the rating tasks you have just completed. If you recognise the word from one of the rating tasks, please select ***Yes****. If you believe the word did not appear in one of the rating tasks, please select* ***No****.*

Results/Discussion

Data consisted of study ratings, numbers of related and unrelated words correctly recognised, numbers of related and unrelated words falsely recognised, as a function of relatedness and valence, and also scores on the PHQ-8. The means for these can be seen in Table 4. Correct and false recognition scores were analysed in t-tests, comparing negative with positive lists for correct related, correct unrelated, false related and false unrelated words. Study ratings were analysed in a 2 (Relatedness: related versus unrelated) x 2 (Valence: negative versus positive) repeated measures ANOVA.

Table 4. *Means for correct recognition for related and unrelated words, false recognition of related and unrelated lures, and study ratings of related and unrelated words.*

	Negative	*Positive*
Correct recognition – Related	9.76 (.53)	9.74 (.54)

Correct recognition – Unrelated	3.88 (.33)	3.88 (.33)
False recognition – Related	.88 (1.09)	.95 (1.43)
False recognition – Unrelated	.26 (.54)	1.05 (.31)
Study ratings – Related	8.58 (.70)	8.3 (.71)
Study ratings - Unrelated	1.14 (.67)	1.19 (.91)

For the analysis of study ratings, there was no main effect of valence, F (1,41) = 2.582, MSE = .212, p = .116, η_p^2 = .059. However, there was a main effect of relatedness, F (1,41) = 3954.208, MSE = .562, p < .001, η_p^2 .990, with higher ratings for related words (8.44) than unrelated words (1.17), in other words, related words were rated as more related and unrelated words were rated as less related. The interaction between valence and relatedness was not significant, F (1,41) = 3.633, MSE = .312, p = .064, η_p^2 = .081.

In the analysis of correct recognition for related words, there was no significant difference between correct recognition of negative and positive words, t (41) = .206, p = .838. For the correct recognition for unrelated words, there was no significant difference between negative and positive words, t (41) = .000, p = .500. As in Experiment 1, there seems to be a ceiling effect with scores for correct recognition from participants being too high to see a difference.

For the false recognition for related words, there was also no significant difference between negative related words and positive related words, t (41) = -.326, p = .746. The only significant difference was for the false recognition of unrelated words, t (41) = - 9.018, p < .001, with higher levels of false recognition for positive unrelated lures (1.05) than negative unrelated lures (.26). As with Experiment 1, it was predicted that females would falsely recognise more negative lures than positive lures, however the findings for Experiment 2 do not support this prediction due to females falsely recognising more positive lures compared to negative lures.

When comparing the relationship between PHQ-8 scores and correct and false recognition, using Pearson's R correlation, there were no significant correlations between PHQ-8 scores and recognition scores (correct and false) for related and unrelated positive word lists, and related and unrelated negative word lists.

Experiment 2 revealed there was no significant difference between false recognition for related negative and related positive lures, but there was a significant difference between unrelated negative and unrelated positive lures, with higher levels of false recognition for unrelated positive lures. As with Experiment 1, the findings of this experiment do not support the hypothesis that females would falsely recognise more negative related lures than positive related lures.

General Discussion

The present study investigated the effects of emotion on false memories using a procedure in which participants imagined hypothetical scenarios and rated a series of words for their relevance to those scenarios. False memories were investigated by omitting some of the more typical items from the rating task and then presenting them as 'lures' in the recognition test. Experiment 1 also investigated gender differences in false memory by presenting neutral and negative scenarios to male and female participants. Experiment 1 revealed no gender differences in false recognition for either related or unrelated negative and neutral words. However, false recognition was affected by emotional valence, for both related and unrelated words. Higher levels of false recognition were found for related neutral words and unrelated negative words. A significant interaction between gender and valence revealed higher levels of false memory in males for negative items, but female false memory levels were not affected by valence. Experiment 2 presented positive and negative scenarios to female participants but failed to find a significant difference for false recognition between related negative and positive lures. Experiment 2 did, however, find a significant difference between unrelated negative and positive lures, with higher false recognition levels for unrelated positive lures.

The original aim of the current study was to extend the findings of Dewhurst et al. (2012), who used emotional DRM lists to reveal females had higher levels of false recall for negative lures compared to men. Sha'bani et al. (2019) also used emotional DRM lists to reveal a significant gender difference in false recall of emotionally negative lures, whereby females showed higher levels of false recall than males. The present study aimed to extend these to more ecologically valid stimuli, however, no effect of gender was found in experiment 1.

A feasible reason as to why this study differs to those which did find a gender difference in false memory is that the present study used a paradigm which does not produce as many false memories as the DRM paradigm, which is the most common method used in studies which have found a gender difference. For example, Dewhurst et al. (2012) and

Sha'bani et al. (2019) both used the DRM paradigm, and their findings did reveal a significant gender difference in false memory. When Dewhurst et al. (2019) developed an alternative method to the DRM paradigm (i.e., presenting schema-related scenarios), they found high levels of false memory for critical lures. The present study used an extended version of Dewhurst et al.'s (2019) paradigm, therefore it was expected that this study would produce similar results. However, Dewhurst et al. (2019) focused on temporal direction, whereas the current study removed this factor and added emotion and gender as factors. Due to gender differences in false memory mainly being found in studies that used the DRM, along with the fact that gender was not a factor of focus in the study by Dewhurst et al. (2019), it is perhaps not surprising that the present study failed to find a gender difference when using a different paradigm that was mainly used to investigate the effect of temporal direction. Dewhurst et al. (2019) found higher levels of false recognition when participants imagined future scenarios rather than past or typical scenarios. One possible direction for future research would be to replicate experiment 1 of the current study but ask participants to imagine the scenarios happening in the future. If false memories are higher with future-oriented scenarios, there may be a greater chance of detecting gender differences.

The issue of participant recruitment is also an explanation for the lack of a gender difference in the present study. It is possible that, in order to find a significant gender different in false memory, equivalent numbers of male and female participants need to be recruited. For example, Dewhurst et al. (2012) recruited 100 participants (50 males and 50 females) and found a significant gender difference. However, despite recruiting 93 participants, the current study did not manage to recruit comparable numbers of males and females, with 58 females and only 35 males. As a result, it was difficult to find a gender difference in this study with the number of female participants outweighing the number of male participants. Furthermore, the study by Sha'bani et al. (2019) recruited 30 participants, with 15 males and 15 females, and although they did not recruit as many participants as this study, they did have an equal number of each gender. Therefore, it is possible equal numbers of male and female participants are required in order to find a gender difference.

Although there was no effect of gender in experiment 1, significant effects of valence were found in both experiment 1 and experiment 2. Experiment 1 found significant effects of valence for both related and unrelated lures, with higher levels of false recognition for neutral related words and higher levels for negative unrelated words. Experiment 2 found an effect of valence for unrelated words, with higher levels of false recognition for positive unrelated words. The effects of valence can be explained by Activation Monitoring Theory (AMT;

Roediger et al., 2001). To recap, AMT attributes the DRM effect to a combination of encoding and retrieval processes. When DRM lists are encoded, associates of the words are automatically activated (e.g., *sleep* is activated in response to *bed*, *wake*, *night* etc.). When the activated items are then presented in the recognition test, participants make source monitoring errors and falsely believe that the activated words were presented in the study lists. Although AMT was developed as an explanation of the DRM effect, it can be extended to other false memory paradigms. One possible explanation for the effect of valence in the related words, in experiment 1, is that the negative words were more distinctive than the neutral words, which is supported by the finding that correct recognition was higher for the related negative words than the related neutral words. Because the negative words were more distinctive, participants were able to use a 'recall-to-reject' strategy (Rotello & Heit, 2000), whereby participants could reject the lures because they could recall the original study items. As a result, this would make them less susceptible to the source monitoring errors that lead to false recognition. For the effect of valence in the unrelated lures, however, it is unclear how the AMT can explain this.

Furthermore, for experiment 1, it is also possible that the neutral items were more closely related to their scenarios than the negative items were. The study ratings for items which were presented at study were higher for neutral items than for negative items. Despite the lures not being rated (due to not being presented in the rating task), it is possible that they were also more closely related to their scenarios. This would have increased the likelihood of generating the lures and consequently falsely recognising them. This could have been confirmed by asking additional participants to rate the lure items. Future research could address this by counterbalancing the target and lure items, such that each set would be included in the rating task for half the participants (i.e., items that are studied words for half the participants would be lures for the other half). This would ensure that measures of relatedness were available for both targets and lures in the recognition test and could be included as covariates in the statistical analyses.

The effects of valence for both related and unrelated lures can be explained by Fuzzy Trace Theory (FTT; Brainerd et al., 2008). According to FTT, participants encode two traces in memory. Verbatim traces preserve specific details of individual items, whereas gist traces preserve the overall theme of a set of items. As Schooler (1998) argued, false memories are mainly based on gist traces. In both experiments, it is likely that participants formed gist traces of the word lists presented during the rating task. The lures in the recognition test were then falsely recognised because they matched the gist trace. Therefore, for experiment 1, it

seems participants remembered the gist of the neutral related words more than the negative related words. In other words, the gist formed for the supermarket and train journey scenarios were stronger, possibly because the neutral scenarios are more familiar than the emotional scenarios. This would have resulted in higher levels of false recognition for the related neutral lures.

Palmer and Dodson (2009) also found that participants in a DRM study falsely recalled more critical lures for neutral lists than for emotional lists. They proposed that the emotional critical lures used in their study were not as accessible so were less likely to come to mind than the neutral critical lures. As discussed above, this argument could be applied the findings of the present study, in particular experiment 1, since participants had higher levels of false recognition for neutral related words which could suggest the negative related words were not as accessible to participants and did not come to mind as readily as the neutral related words. Furthermore, Bodson et al. (2006) argued emotion has a minor impact on false recognition with emotional critical lures being more distinctive than non-emotional critical lures, therefore participants are less likely to falsely recognise distinctive items. This can be applied to both experiments in this study. Although experiment 1 did reveal a main effect of valence, it was the neutral related words which were more falsely recognised, which could suggest the negative related words were more distinctive to participants so were more likely to be correctly recognised. For experiment 2, both word lists were emotional (i.e., emotionally positive and negative) which, according to Bodson et al. (2006) would make them more distinctive than neutral word lists. Therefore, the non-significant difference between the related negative and related positive lures was perhaps due to the fact that the two sets of lures were equally distinctive to participants.

For the false recognition of unrelated lures in experiment 1, participants appeared to remember the gist of the negative unrelated words more than the neutral unrelated words. This is consistent with the proposal by Brainerd et al. (2008) that participants can also form an emotional gist, which represents the emotional valence of a set of items. It is possible that the negative unrelated lures were falsely recognised because they matched the emotional gist of the scenarios. The notion of an emotional gist can also be applied to experiment 2, where females falsely recognised the positive unrelated words more than the negative unrelated words. In term of FTT, it is possible that participants formed stronger emotional gists for the picnic and holiday scenarios than for the hospital and exam scenarios, which resulted in higher levels of false recognition for the positive lures. Research has shown that people have a 'positivity bias' and are more likely to remember positive events than negative (see Adler &

Pansky, 2020, for a recent review). The current findings suggest that this positivity bias extends to the ability to extract the emotional gist of a set of stimuli.

As a result of the limited levels of false memory the schema-based paradigm produced, it is suggested that further studies investigating gender differences in false memory adopt a different method using DRM-style stories. As argued by Gallo (2010), the nature of the DRM paradigm is artificial. However, use of the DRM paradigm has revealed gender differences in false memory (e.g., Dewhurst et al., 2012; Sha'bani et al., 2019), which leads to the suggestion that perhaps a paradigm needs to be developed which combines the DRM with more realistic paradigms that are higher in ecological validity. Therefore, using DRM-style stories may be the answer to this issue. Dewhurst et al. (2008) suggests scripts are a substitute to the typical word list paradigms when investigating distortions in memory that are generated outside of the laboratory. Furthermore, the authors suggest when individuals listen to a story, the activation of a script leads to distorted memory which is consistent with that script. The use of scripts offers cognitive economy by allowing individuals to infer certain actions occurred without actually being explicitly informed of their occurrence (Dewhurst et al., 2008). These inferences are frequently incorporated into the memory of a story which leads to distortions and inaccurate memory when recalling that story (Bransford et al., 1972; Bower et al., 1979; Lampinen et al., 2000). Studies which have used this story paradigm have found high levels of false memory in participants. For example, Bower et al. (1979) asked participants to recall stories centred around familiar situations. They found participants falsely recalled ideas which were consistent that the script but not explicitly mentioned in those stories. Another study by Lampinen et al. (2000) presented participants with stories in which the main character performed familiar activities, and participants were more likely to falsely recognise the typical lure actions.

Limitations of previous studies investigating false memory using story paradigms are they have not used emotional stories or applied this paradigm to gender. As a result, future studies could employ the DRM story paradigm to investigate emotion and gender differences in false memory whilst using more ecologically valid materials. Dewhurst et al. (2007) found the use of DRM stories increased levels of false memory in children. This study used stories containing words from DRM lists. Similar to previous DRM-based studies, a recognition test was administered which consisted of studied words from the DRM lists, as well as critical lures. The authors revealed five-year-old children displayed higher levels of false recognition compared to older children due to their inability to reject those lures which were consistent with the stories. Dewhurst et al. argued that the ability of the five-year-old children to make

inferences based on the themes of the DRM stimuli were strengthened by the story context. Another study to use the DRM story paradigm was Howe and Wilkinson (2011), who despite also recruiting child participants, revealed opposing findings to Dewhurst et al. (2007). Howe and Wilkinson found, when DRM word lists were incorporated into stories, older children were more susceptible to false memory compared to younger children. Despite previous studies using DRM stories to reveal false memory, the majority used children as participants. Therefore, future studies can extend these by recruiting adult participants, and also extend to, as mentioned earlier, gender and emotional stories.

Although the focus of the current study was on the effects of emotion and gender on false recognition, the effects of these variables on correction recognition were also measured. However, most of the comparisons were nonsignificant, possibly as a result of ceiling effects. This was surprising given that we used comparable numbers of test items to Dewhurst et al. (2019) who did not observe ceiling effects. Future research could overcome this by increasing the numbers of test items or increasing the retention interval between the study period and the recognition test. Despite this issue, there was a significant effect of valence in experiment 1, whereby correct recognition was higher for negative related words than for neutral related words. This is consistent with the effects of negative emotion on correct recognition found in previous studies (e.g., Dewhurst & Parry, 2000; Ochsner, 2000; Kensinger & Corkin, 2003).

The results of the present study suggest that gender does not influence levels of false memory when using schema-related scenarios. However, in order to find a significant gender difference in false memory, it is suggested that equivalent numbers of participants of each gender should be recruited. Although gender differences in false memory have been found, the majority of those studies used the DRM paradigm (Dewhurst et al., 2012; Sha'bani et al., 2019), which has been criticised for lacking ecological validity (Gallo, 2010). Therefore, future studies may benefit from using a DRM-style story paradigm which incorporates the classic nature of the DRM word lists for recognition tests but increases ecological validity with the use of stories. Unlike previous research using story paradigms (Bower et al., 1979; Lampinen et al., 2000; Dewhurst et al., 2008), future studies would apply this paradigm to gender and use emotional stories in order to investigate the effects of gender and emotion on false memory.

References

Adams, S., Kuebli, J., Boyle, P. A., & Fivush, R. (1995). Gender differences in parent-child conversations about past emotions: A longitudinal investigation. *Sex Roles*, *33*(5), 309–323. https://doi.org/10.1007/BF01954572

Adler, O., & Pansky, A. (2020). A 'rosy view' of the past: Positive memory biases. In *Cognitive biases in health and psychiatric disorders: Neurophysiological foundations* (pp. 139–171). Elsevier Academic Press. https://doi.org/10.1016/B978-0-12-816660-4.00007-6

Bauer, P. J., Stennes, L., & Haight, J. C. (2003). Representation of the inner self in autobiography: Women's and men's use of internal states language in personal narratives. *Memory*, *11*(1), 27–42. https://doi.org/10.1080/741938176

Bauste, G., & Ferraro, F. R. (2004). Gender Differences in False Memory Production. *Current Psychology: A Journal for Diverse Perspectives on Diverse Psychological Issues*, *23*, 238–244. https://doi.org/10.1007/s12144-004-1023-0

Bloise, S. M., & Johnson, M. K. (2007). Memory for emotional and neutral information: Gender and individual differences in emotional sensitivity. *Memory (Hove, England)*, *15*(2), 192–204. https://doi.org/10.1080/09658210701204456

Boals, A. (2010). Events that have become central to identity: Gender differences in the centrality of events scale for positive and negative events. *Applied Cognitive Psychology*, *24*(1), 107–121. https://doi.org/10.1002/acp.1548

Bower, G. H., Black, J. B., & Turner, T. J. (1979). Scripts in memory for text. *Cognitive Psychology*, *11*(2), 177–220. https://doi.org/10.1016/0010-0285(79)90009-4

Brainerd, C. J., & Reyna, V. F. (1998). Fuzzy-trace theory and children's false memories. *Journal of Experimental Child Psychology*, *71*(2), 81–129. https://doi.org/10.1006/jecp.1998.2464

Brainerd, C. J., Stein, L. M., Silveira, R. A., Rohenkohl, G., & Reyna, V. F. (2008). How does negative emotion cause false memories? *Psychological Science*, *19*(9), 919–925. https://doi.org/10.1111/j.1467-9280.2008.02177.x

Bransford, J. D., Barclay, J. R., & Franks, J. J. (1972). Sentence memory: A constructive versus interpretive approach. *Cognitive Psychology*, *3*(2), 193–209. https://doi.org/10.1016/0010-0285(72)90003-5

Brewer, W. F., & Treyens, J. C. (1981). Role of schemata in memory for places. *Cognitive Psychology*, *13*(2), 207–230. https://doi.org/10.1016/0010-0285(81)90008-6

Broverman, I. K., Vogel, S. R., Broverman, D. M., Clarkson, F. E., & Rosenkrantz, P. S. (1972). Sex-Role Stereotypes: A Current Appraisal1. *Journal of Social Issues*, *28*(2), 59–78. https://doi.org/10.1111/j.1540-4560.1972.tb00018.x

Buckner, J. P., & Fivush, R. (1998). Gender and self in children's autobiographical narratives. *Applied Cognitive Psychology*, *12*(4), 407–429. https://doi.org/10.1002/(SICI)1099-0720(199808)12:4<407::AID-ACP575>3.0.CO;2-7

Budson, A. E., Todman, R. W., Chong, H., Adams, E. H., Kensinger, E. A., Krangel, T. S., & Wright, C. I. (2006). False recognition of emotional word lists in aging and Alzheimer disease. *Cognitive and Behavioral Neurology: Official Journal of the Society for Behavioral and Cognitive Neurology*, *19*(2), 71–78. https://doi.org/10.1097/01.wnn.0000213905.49525.d0

Ceci, S. J., & Bruck, M. (1998). The Ontogeny and Durability of True and False Memories: A Fuzzy Trace Account. *Journal of Experimental Child Psychology*, *71*(2), 165–169. https://doi.org/10.1006/jecp.1998.2468

Conway, M. A. (2005). Memory and the self. *Journal of Memory and Language*, *53*(4), 594–628. https://doi.org/10.1016/j.jml.2005.08.005

Conway, M. A. (2009). Episodic memories. *Neuropsychologia*, *47*(11), 2305–2313. https://doi.org/10.1016/j.neuropsychologia.2009.02.003

Cowan, N., & Davidson, G. (1984). Salient childhood memories. *The Journal of Genetic Psychology: Research and Theory on Human Development*, *145*(1), 101–107. https://doi.org/10.1080/00221325.1984.10532254

Davis, P. J. (1999). Gender differences in autobiographical memory for childhood emotional experiences. *Journal of Personality and Social Psychology*, *76*, 498–510. https://doi.org/10.1037/0022-3514.76.3.498

De Mayo, R. M., & Diliberto, K. A. (2003). False Memory for Pictures of Common Household Chores: Evidence of a Gender Stereotype. *Psi Chi Journal of Psychological Research*, *8*(2), 62–69. https://doi.org/10.24839/1089-4136.JN8.2.62

Deese, J. (1959). On the prediction of occurrence of particular verbal intrusions in immediate recall. *Journal of Experimental Psychology*, *58*(1), 17–22. https://doi.org/10.1037/h0046671

De Vries, B., Blando, J. A., Walker, L. J. (1995). An Exploratory Analysis of the Content and Structure of the Life Review. In *The Art and Science of Reminiscing*. Taylor & Francis.

Dewhurst, S. A., Anderson, R. J., Grace, L., & Howe, D. (2019). Simulation, false memories, and the planning of future events. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *45*, 26–36. https://doi.org/10.1037/xlm0000575

Dewhurst, S. A., Anderson, R. J., & Knott, L. M. (2012). A gender difference in the false recall of negative words: Women DRM more than men. *Cognition and Emotion*, *26*, 65–74. https://doi.org/10.1080/02699931.2011.553037

Dewhurst, S. A., & Parry, L. A. (2000). Emotionality, distinctiveness, and recollective experience. *European Journal of Cognitive Psychology*, *12*(4), 541–551. https://doi.org/10.1080/095414400750050222

Dewhurst, S. A., Pursglove, R. C., & Lewis, C. (2007). Story contexts increase susceptibility to the DRM illusion in 5-year-olds. *Developmental Science*, *10*(3), 374–378. https://doi.org/10.1111/j.1467-7687.2007.00592.x

Dewhurst, S., Holmes, S., Swannell, E., & Barry, C. (2008). Beyond the text: Illusions of recollection caused by script-based inferences. *European Journal of Cognitive Psychology - EUR J COGN PSYCHOL*, *20*, 367–386. https://doi.org/10.1080/09541440701482551

Dudycha, G. J., & Dudycha, M. M. (1933). Some factors and characteristics of childhood memories. *Child Development*, *4*, 265–278. https://doi.org/10.2307/1125689

El Sharkawy, J., Groth, K., Vetter, C., Beraldi, A., & Fast, K. (2008). False memories of emotional and neutral words. *Behavioural Neurology*, *19*(1–2), 7–11. https://doi.org/10.1155/2008/587239

Ely, R., & Ryan, E. (2008). Remembering talk: Individual and gender differences in reported speech. *Memory*, *16*(4), 395–409. https://doi.org/10.1080/09658210801949869

Fivush, R., Berlin, L. J., Sales, J. M., Mennuti-Washburn, J., & Cassidy, J. (2003). Functions of parent-child reminiscing about emotionally negative events. *Memory (Hove, England)*, *11*(2), 179–192. https://doi.org/10.1080/741938209

Friedman, A., & Pines, A. (1991). Sex differences in gender-related childhood memories. *Sex Roles*, *25*(1), 25–32. https://doi.org/10.1007/BF00289314

Galea, L. A. M., & Kimura, D. (1993). Sex differences in route-learning. *Personality and Individual Differences*, *14*(1), 53–65. https://doi.org/10.1016/0191-8869(93)90174-2

Gallo, D. A. (2010). False memories and fantastic beliefs: 15 years of the DRM illusion. *Memory & Cognition*, *38*(7), 833–848. https://doi.org/10.3758/MC.38.7.833

Grysman, A., & Hudson, J. A. (2013). Gender differences in autobiographical memory: Developmental and methodological considerations. *Developmental Review*, *33*(3), 239–272. https://doi.org/10.1016/j.dr.2013.07.004

Grysman, A., Merrill, N., & Fivush, R. (2017). Emotion, gender, and gender typical identity in autobiographical memory. *Memory*, *25*, 289–297. https://doi.org/10.1080/09658211.2016.1168847

Herlitz, A., Airaksinen, E., & Nordström, E. (1999). Sex differences in episodic memory: The impact of verbal and visuospatial ability. *Neuropsychology*, *13*(4), 590–597. https://doi.org/10.1037//0894-4105.13.4.590

Herlitz, A., Nilsson, L. G., & Bäckman, L. (1997). Gender differences in episodic memory. *Memory & Cognition*, *25*(6), 801–811. https://doi.org/10.3758/bf03211324

Hill, R., Wahlin, A., Herlitz, A., Winblad, B., & Bäckman, L. (1995). Predicting memory performance in optimally healthy very old adults. *Journal of Mental Health and Aging*, *1*, 55–65.

Howe, M. L., Garner, S. R., Dewhurst, S. A., & Ball, L. J. (2010). Can false memories prime problem solutions? *Cognition*, *117*(2), 176–181. https://doi.org/10.1016/j.cognition.2010.08.009

Howe, M. L., & Wilkinson, S. (2011). Using story contexts to bias children's true and false memories. *Journal of Experimental Child Psychology*, *108*(1), 77–95. https://doi.org/10.1016/j.jecp.2010.06.009

Huston, A. C. (1988). Seeing Female: Social roles and personal lives. In *In S. S. Brehm (Ed.)* (pp. 7–19).

Johannsdottir, K. R., Rafnsdottir, H. B., Oddsson, A. H., & Gylfason, H. F. (2021). The Impact of Emotion and Sex on Fabrication and False Memory Formation. *International Journal of Environmental Research and Public Health*, *18*(22), 12185. https://doi.org/10.3390/ijerph182212185

Kensinger, E. A., & Corkin, S. (2003). Memory enhancement for emotional words: Are emotional words more vividly remembered than neutral words? *Memory & Cognition*, *31*(8), 1169–1180. https://doi.org/10.3758/BF03195800

Kramer, J. H., Delis, D. C., & Daniel, M. (1988). Sex differences in verbal learning. *Journal of Clinical Psychology*, *44*(6), 907–915. https://doi.org/10.1002/1097-4679(198811)44:6<907::AID-JCLP2270440610>3.0.CO;2-8

Kreiner, D., Price, R., Gross, A. M., & Appleby, K. L. (2004). *False Recall Does Not Increase When Words are Presented in a Gender-Congruent Voice*. https://www.semanticscholar.org/paper/False-Recall-Does-Not-Increase-When-Words-are-in-a-Kreiner-Price/c8f766e3fed9052d1a00001dc81644de67ca663f

Kring, A. M., & Gordon, A. H. (1998). Sex differences in emotion: Expression, experience, and physiology. *Journal of Personality and Social Psychology*, *74*(3), 686–703. https://doi.org/10.1037/0022-3514.74.3.686

Lampinen, J. M., Faries, J. M., Neuschatz, J. S., & Toglia, M. P. (2000). Recollections of things schematic: The influence of scripts on recollective experience. *Applied Cognitive Psychology*, *14*(6), 543–554. https://doi.org/10.1002/1099-0720(200011/12)14:6<543::AID-ACP674>3.0.CO;2-K

Lenton, A., Blair, I., & Hastie, R. (2001). Illusions of Gender: Stereotypes Evoke False Memories. *Journal of Experimental Social Psychology*, *37*, 3–14. https://doi.org/10.1006/jesp.2000.1426

McDermott, K. B., & Roediger III, H. L. (1998). Attempting to avoid illusory memories: Robust false recognition of associates persists under conditions of explicit warnings and immediate testing. *Journal of Memory and Language*, *39*(3), 508–520. https://doi.org/10.1006/jmla.1998.2582

Merriam, S. B., & Cross, L. H. (1982). Adulthood and reminiscence: A descriptive study. *Educational Gerontology*, *8*(3), 275–290. https://doi.org/10.1080/0360127820080307

Miller, M. B., & Gazzaniga, M. S. (1998). Creating false memories for visual scenes. *Neuropsychologia*, *36*(6), 513–520. https://doi.org/10.1016/S0028-3932(97)00148-6

Ochsner, K. N. (2000). Are affective events richly recollected or simply familiar? The experience and process of recognizing feelings past. *Journal of Experimental Psychology: General*, *129*(2), 242–261. https://doi.org/10.1037/0096-3445.129.2.242

Oyserman, D., & Markus, H. R. (1993). The sociocultural self. In *The self in social perspective* (pp. 187–220). Lawrence Erlbaum Associates, Inc.

Palmer, J. E., & Dodson, C. S. (2009). Investigating the mechanisms fuelling reduced false recall of emotional material. *Cognition and Emotion*, *23*(2), 238–259. https://doi.org/10.1080/02699930801976663

Pauls, F., Petermann, F., & Lepach, A. C. (2013). Gender differences in episodic memory and visual working memory including the effects of age. *Memory (Hove, England)*, *21*(7), 857–874. https://doi.org/10.1080/09658211.2013.765892

Payne, J., Nadel, L., Allen, J., Thomas, K., & Jacobs, W. (2002). The effects of experimentally induced stress on false recognition. *Memory (Hove, England)*, *10*, 1–6. https://doi.org/10.1080/09658210143000119

Pesta, B., Murphy, M., & Sanders, R. (2001). Are emotionally charged lures immune to false memory? *Journal of Experimental Psychology. Learning, Memory, and Cognition*, *27*, 328–338. https://doi.org/10.1037/0278-7393.27.2.328

Pillemer, D., Wink, P., Didonato, T., & Sanborn, R. (2003). Gender differences in autobiographical memory styles of older adults. *Memory (Hove, England)*, *11*, 525–532. https://doi.org/10.1080/09658210244000117

Pohl, R., Bender, M., & Lachmann, G. (2005). Autobiographical memory and social skills of men and women. *Applied Cognitive Psychology*, *19*, 745–759. https://doi.org/10.1002/acp.1104

Radloff, L. S. (1977). The CES-D Scale: A Self-Report Depression Scale for Research in the General Population. *Applied Psychological Measurement*, *1*(3), 385–401. https://doi.org/10.1177/014662167700100306

Roediger, H. L., & McDermott, K. B. (1995). Creating false memories: Remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *21*, 803–814. https://doi.org/10.1037/0278-7393.21.4.803

Roediger, H. L., Watson, J. M., McDermott, K. B., & Gallo, D. A. (2001). Factors that determine false recall: A multiple regression analysis. *Psychonomic Bulletin & Review*, *8*(3), 385–407. https://doi.org/10.3758/bf03196177

Ros, L., & Latorre, J. M. (2010). Gender and age differences in the recall of affective autobiographical memories using the autobiographical memory test. *Personality and Individual Differences*, *49*(8), 950–954. https://doi.org/10.1016/j.paid.2010.08.002

Ros, L., Ricarte, J. J., Serrano, J. P., Nieto, M., Aguilar, M. J., & Latorre, J. M. (2014). Overgeneral autobiographical memories: Gender differences in depression. *Applied Cognitive Psychology*, *28*(4), 472–480. https://doi.org/10.1002/acp.3013

Ross, M., & Holmberg, D. (1990). Recounting the past: Gender differences in the recall of events in the history of a close relationship. In *Self-inference processes: The Ontario symposium, Vol. 6.* (pp. 135–152). Lawrence Erlbaum Associates, Inc.

Rotello, C. M., & Heit, E. (2000). Associative recognition: A case of recall-to-reject processing. *Memory & Cognition*, *28*(6), 907–922. https://doi.org/10.3758/BF03209339

Schooler, J. W. (1998). The distinctions of false and fuzzy memories. *Journal of Experimental Child Psychology*, *71*(2), 130–143. https://doi.org/10.1006/jecp.1998.2465

Seamon, J., Luo, C., Kopecky, J., Price, C., Rothschld, L., Fung, N., & Schwartz, M. (2002). Are false memories more difficult to forget than accurate memories? The effect of retention interval on recall and recognition. *Memory & Cognition*, *30*, 1054–1064. https://doi.org/10.3758/BF03194323

Sexton, K. A., & Dugas, M. J. (2008). The Cognitive Avoidance Questionnaire: Validation of the English translation. *Journal of Anxiety Disorders*, *22*(3), 355–370. https://doi.org/10.1016/j.janxdis.2007.04.005

Sha'bani, M., Khosrowabadi, R., & Salehi, J. (2019). Do gender stereotypes give rise to false memories? *Journal of Neurodevelopmental Cognition*, *2*(1), 27–38. https://doi.org/10.29252/jncog.1.2.27

Shaw, J. (2020). Do False Memories Look Real? Evidence That People Struggle to Identify Rich False Memories of Committing Crime and Other Emotional Events. *Frontiers in Psychology*, *11*, 650. https://doi.org/10.3389/fpsyg.2020.00650

Sotgiu, I. (2019). Gender Differences and Similarities in Autobiographical Memory for Eudaimonic Happy Events. *Journal of Happiness Studies*, *20*(5), 1457–1479. https://doi.org/10.1007/s10902-018-0006-z

Steffens, M. C., & Mecklenbräuker, S. (2007). False memories: Phenomena, theories, and implications. *Zeitschrift Für Psychologie/Journal of Psychology*, *215*(1), 12–24. https://doi.org/10.1027/0044-3409.215.1.12

Tannen, D. (1994). Gender and discourse. *New York: Oxford University Press.*

Thorne, A. (1995). Developmental truths in memories of childhood and adolescence. *Journal of Personality*, *63*(2), 139–163. https://doi.org/10.1111/j.1467-6494.1995.tb00805.x

Tulving, E. (1972). Episodic and semantic memory. In *Organization of memory* (pp. xiii, 423–xiii, 423). Academic Press.

Wang, Q. (2009). Are Asians forgetful? Perception, retention, and recall in episodic remembering. *Cognition*, *111*, 123–131. https://doi.org/10.1016/j.cognition.2009.01.004

Wang, Q. (2013). Gender and emotion in everyday event memory. *Memory*, *21*(4), 503–511. https://doi.org/10.1080/09658211.2012.743568

West, R. L., Crook, T. H., & Barron, K. L. (1992). Everyday memory performance across the life span: Effects of age and noncognitive individual differences. *Psychology and Aging*, *7*(1), 72–82. https://doi.org/10.1037//0882-7974.7.1.72

Yarmey, A. D. (1993). Stereotypes and recognition memory for faces and voices of good guys and bad guys. *Applied Cognitive Psychology*, *7*(5), 419–431. https://doi.org/10.1002/acp.2350070505

Appendices

Appendix A: 'Ethics form' submitted for experiment 1.

RESEARCH ETHICS COMMITTEE

FORM A – New Application

(Involving human participants, subjects or material)

It is essential that you are familiar with the University Code of Good Research Practice, Research Ethics Policy and the Procedures for Granting Ethical Approval before you complete this form that can be found here. Please confirm that you have read and understood these documents:

X	Yes		No

Please read each question carefully, taking note of instructions and completing all parts, marking check boxes with an X where appropriate. If a question is not applicable please indicate so. Where a question asks for information which you have previously provided in answer to another question, please refer to your earlier answer rather than repeating information.

Ethics reference number (for office use):	
WorkTribe project URL	

PART A: SUMMARY

A.1 Title of the research Imagining hypothetical events.	
A.2 Principal investigator's contact details	
Name *(Title, first name, surname)*	Miss Beth Markham
Position	Postgraduate Student
Faculty/School	Faculty of Health Sciences / School of Psychology and Social Work
Telephone number	07500947734
University of Hull email address	b.l.markham-2018@hull.ac.uk
A.3 To be completed by students only	
Qualification working towards (e.g. Masters, PhD, ClinPsyD)	Masters (MRes Research Methods in Psychology)
Student number	201904095
Supervisor's name (Title, first name, surname)	Professor Steve Dewhurst
Faculty/ School	Faculty of Health Sciences / School of Psychology & Social Work
Supervisor's telephone number	01482 465931
Supervisor's email address	s.dewhurst@hull.ac.uk

A.4 Other relevant members of the research team (e.g. co-investigators, co-supervisors)	
Name *(Title, first name, surname)*	Dr Rachel Anderson
Position	Reader in Psychology
Faculty/ School	Faculty of Health Sciences / School of Psychology & Social Work
Telephone number	01482 465582
Institution	University of Hull
Email address	Rachel.anderson@hull.ac.uk

Name *(Title, first name, surname)*	
Position	
Faculty/ School	
Telephone number	
Email address	

A.5 Select from the list below to describe your research: (Mark with X all that apply)

X	Research on or with human participants
X	Research working with data of human participants
	New data collected by qualitative methods
X	New data collected by quantitative methods
	New data collected from observing individuals or populations
	Routinely collected data or secondary data
	Research working with aggregated or population data
	Research using already published data or data in the public domain
	Research taking direct measurements from individuals e.g. physiology
	Research working with human tissue samples
	Research involving any invasive techniques including administering substances, food (other than refreshments), vitamins or supplements.
	Research involving discussion of sensitive topics or topics that could be considered sensitive
	Research involving discussion of culturally sensitive issues
	Prolonged or frequent participant involvement
	Research involving members of the public in a research capacity (participant research)
	Research conducted outside the UK
	Research involving accessing social media sites
	Research involving accessing or encountering security sensitive material
	Research involving accessing websites or material associated with extreme or terrorist communities

☐ Research involving storing or transmitting any material that could be interpreted as sympathetic, endorsing or promoting terrorist acts

☐ Research involving financial inducements for participants (other than reasonable expenses and compensation for time)

PART B: THE RESEARCH

B.1 Give a short summary of the research (max 300 words)

*This section must be completed in **language comprehensible to the lay person**. Your answers should be easily understood by someone who is not experienced in the field you are researching, (eg a member of the public) - otherwise it may be returned to you. Where technical terms are used they should be explained. Any acronyms not generally known should be described in full. Do not simply reproduce or refer to the research method or protocol, although these can also be submitted to provide any technical information that you think the ethics committee may require. This section should cover the main parts of the proposal.*

In plain English provide a brief summary of the aims and objectives of the research.

- The summary should briefly describe the background to the research and why it is important,
- the questions it will answer and potential benefits,
- the study design and what is involved for participants.

False memories are defined as the incorrect recollections of an event, or parts of an event, and when recalling this false memory, that person is convinced they are accessing a real memory (Shaw, 2020). A common method used to test false memories is the Deese/Roediger-McDemott (DRM), named after studies by Deese (1959) and Roediger and McDermott (1995). In this paradigm, subjects are presented with lists of semantically related words to a "critical lure". The critical lure is not presented but the paradigm measures whether participants recall this word previously. Previous research has shown that there are individual differences in susceptibility to the DRM effect. For example, levels of false memory are higher in older adults than young adults (Balota et al., 1999), and higher in people with low working memory capacity (Watson et al., 2005). Research by Dewhurst, Anderson, and Knott (2012) also found a gender difference, whereby women showed higher levels of false recall than men. This effect, however, was only found in DRM lists that were of negative emotional valence.

The findings of Dewhurst et al. suggest women reflect on associations in negative word lists more than men, and as a result are more likely to generate negative critical lures. The aim of the planned research is to investigate whether males and females' false memory differ when participating in a more ecologically-valid false memory paradigm based on schemas. We will use the procedure developed by Dewhurst et al

(2019) in which participants imagine familiar scenarios (e.g., a holiday) and are asked to rate a series of words for how relevant they are to this scenario. They are then given a surprise recognition test for the words they rated. Dewhurst et al. found that this procedure produces high levels of false recognition for words that are relevant to the scenario but were not presented during the rating task. If females are more sensitive to emotional stimuli and reflect on associations in negative word lists more than men when participating in the DRM paradigm, then the planned research asks the question of whether females will show higher false recognition rates than males for the negative scenarios.

Presentation of the stimuli and data collection will be controlled using Qualtrics running on PCs in a quiet research lab on AS3. Participants will be presented with four schema-based scenarios. Two scenarios will be emotionally neutral (e.g., a train ride and a trip to the supermarket), and two scenarios will be emotionally negative (e.g., going to hospital and being in an exam). A list of words will be presented, and participants will be asked to rate how relevant they are to each scenario. A filler task will then be given to participants (e.g., spot the difference task). To follow this, participants will complete a recognition test of words including studied and unstudied words from each scenario previously presented. The frequency of participants falsely recognising words will be measured. Participants will also be asked to complete the Patient Health Questionnaire (PHQ-8). This will be presented as a measure of their current mood and will enable us to determine whether any gender differences are due to differences in mood.

The data for this research will consist of word ratings, the frequency of correct and false recognition scores, and scores of the PHQ-8. Comparison of males and females' performance on the recognition test will allow us to determine a gender difference in schema-driven false memories.

B.2 Proposed study dates and duration

Research start date (DD/MM/YY): 10/10/2022 Research end date (DD/MM/YY): 28/05/2023

Fieldwork start date (DD/MM/YY): 10/10/2022 Fieldwork end date (DD/MM/YY): 28/05/2023

B.3 Where will the research be undertaken? (i.e. in the street, on University of Hull premises, in schools, on-line etc.)

University of Hull premises

Do you have permission to conduct the research on the premises?

X	Yes		No

If no, please describe how this will be addressed.

B.4 Does the research involve any risks to the researchers themselves, or people not directly involved in the research? *E.g. lone working*

	Yes	X	No

If yes, please describe and say how these will be addressed (include reference to relevant lone working policies):

If yes, please include a copy of your completed risk assessment form with your application.

NB: If you are unsure whether a risk assessment is required visit the Health and Safety SharePoint site. Risk assessments are required for all fieldwork taking place off campus.

B.5 What are the main ethical issues with the research and how will these be addressed?
Indicate any issues on which you would welcome advice from the ethics committee

The experiment involves the presentation of negative schema-based scenarios and words negative in valence (e.g., hospital and stitches). Despite being common words within the English language, participants may find some words and scenarios upsetting. Participants will be informed of the nature of the stimuli in the Participant Information Sheet. Also, the information sheet and debrief sheet will include support services (The Samaritans, Shout, and Hull University Student Assistance Programme) should participants wish to discuss any issues confidentially.

B.6 Does the research involve an international collaborator or research conducted overseas:

	Yes		X	No

If yes, describe any ethical review procedures that you will need to comply with in that country:

Describe the measures you have taken to comply with these:

Include copies of any ethical approval letters/ certificates with your application.

PART C: HUMAN PARTCIPANTS AND SUBJECTS

C.1 Are the participants expected to be from any of the following groups? (Mark with X as appropriate)

	Children under 16 years old. ***Specify age group:*** _____
	Adults with learning disabilities
	Adults with other forms of mental incapacity or mental illness
	Adults in emergency situations
	Prisoners or young offenders
X	Those who could be considered to have a particularly dependent relationship with the investigator, e.g. members of staff, students
	Other vulnerable groups
	No participants from any of the above groups

Include in Section D5 details of extra steps taken to assure their protection.

Does your research require you to have a DBS check?

	Yes		X	No

It is the researcher's responsibility to check whether a DBS check (or equivalent) is required and to obtain one if it is needed. See also http://www.homeoffice.gov.uk/agencies-public-bodies/dbs

C.2 What are the potential benefits and/or risks for research participants in both the short and medium-term?
Risks may include health and safety, physical harm and emotional well-being

There main benefit for participants is that they will receive course credit as part of the undergraduate Research Methods Modules, and also gain experience of lab-based research. Due to the task of rating words for how relevant they are to the schema-based scenarios, some of which will be emotionally negative, some participants may find this task upsetting when considering emotionally negative scenarios. Is it also possible that the PHQ-8 may cause some emotional discomfort.

What will be done to avoid or minimise the risks?

The nature of tasks will be explained to participants in the Participant Information Sheet and will also be reiterated in the Debriefing Information Sheet. The Participant Information Sheet and Debrief sheet will direct participants to sources of support (The Samaritans, Shout, and Hull University Student Assistance Programme), should they feel the need to discuss any issues in confidence. Furthermore, there is no obligation for participants to participate in this research, and they are able to withdraw from the study at any point. It will be made clear to participants that if they feel at any point they do not wish to continue with the experiment, they are able to terminate their involvement in the study.

C.3 Is there a potential for criminal or other disclosures to the researcher requiring action to take place during the research? (e.g. during interviews/group discussions, or use of screen tests for drugs?)

	Yes		X	No

If yes, please describe and say how these will be addressed:

C.4 What will participants be asked to do in the study? *(e.g. number of visits, time involved, travel required, interviews)*

The experiment will involve a single visit to the Department of Psychology's research labs in the Applied Science 3 building, lasting approximately 45 minutes. Participants will be seated at individual workstations and first be given the Patient Health Questionnaire (PHQ-8) to fill out. They will then be presented with four schema-based scenarios, one at a time, and asked to imagine them. Two scenarios will be emotionally neutral (e.g., a train ride and a trip to the supermarket), and two scenarios will be emotionally negative (e.g., going to hospital and being in an exam). A list of words will be presented with each scenario, and participants will be asked to rate how relevant each word is to that scenario. Participants will then be asked to complete a filler task (e.g., spot the different task), and finally will complete a recognition test of words including studied and unstudied words from each scenario previously presented.

PART D: RECRUITMENT & CONSENT PROCESSES

How participants are recruited is important to ensure that they are not induced or coerced into participation. The way participants are identified may have a bearing on whether the results can be generalised. Explain each point and give details for subgroups separately if appropriate. Also say who will identify, approach and recruit participants. Remember to include all advertising material (posters, emails etc) as part of your application.

D.1 Describe <u>how</u> potential participants in the study be identified, approached and recruited and <u>who</u> will do this:

(i) identified:

All undergraduate students in the Department of Psychology complete 2-3 hours of research participation in trimesters 1 and 2. This is part of their research training.

(ii) approached:

The experiment will be advertised to students via the SONA system (https://hull.sona-systems.com/Default.aspx?ReturnUrl=%2fmain.aspx).

(iii) recruited:

Students sign up for experiments via the SONA system. They will be provided with a brief summary of the procedure and information about the time and location of the experiment.

D.2 Will you be excluding any groups of people, and if so what is the rationale for that?
Excluding certain groups of people, intentionally or unintentionally may be unethical in some circumstances. It may be wholly appropriate to exclude groups of people in other cases

The study will be available to all Level 4 and Level 5 Psychology students. Although, they will be required to have sufficient fluency in the English language in order to understand the instructions and stimuli. However, this is not likely to be a problem within the student population at the University of Hull because any international students will have had to pass English proficiency tests prior to study at this university. Participants will also need to have normal or corrected vision because tasks and stimuli will be visually presented.

D.3 How many participants will be recruited and how was the number decided upon?
It is important to ensure that enough participants are recruited to be able to answer the aims of the research. The number of participants should be sufficient to achieve worthwhile results but should not be so high as to involve unnecessary recruitment and burdens for participants. This is especially pertinent in research which involves an element of risk. Describe here how many participants will be recruited, and whether this will be enough to answer the research question.

A total of 100 participants will be recruited, 50 males and 50 females. Dewhurst, Anderson & Knott (2012), who also used 100 participants (50 male and 50 female), and this number was enough for their findings to suggest a gender difference in the false recall of negative lures. Dewhurst et al. based their sample size of the recommendation by Seamon et al. (2002) that gender comparisons of false memory should include a minimum of 50 males and 50 females.

D.4 Will the research involve any element of deception?

X	Yes		No

If yes, please describe why this is necessary and whether participants will be informed at the end of the study.

This study involves minor deception in that participants will not be informed, prior to completing the rating task, that they will also be asked to remember the words they rated later on in the experiment. The minor deception is essential to ensure the participants engage in the rating task as opposed to trying to 'learn' the words they are presented with. The reason for not telling participants about the memory test will be explained in the debrief, as well as informing them that we were interested in their correct and erroneous responses on the memory task.

The Debrief Sheet can be found in the appendix of this application.

D.5 Will informed consent be obtained from the research participants?

X	Yes		No

If yes, <u>give details</u> of how it will be done. Give details of any particular steps to provide information (in addition to a written information sheet) e.g. videos, interactive material. If you are not going to be obtaining informed consent you will need to justify this.

Potential participants will be able to read a brief description of the experiment on the SONA system. They can then follow the link to the Participant Information Sheet where they can read full information about the study. If willing to participate in the study, participants can then book a slot to participate in the study. When attending their timeslot, participants will be presented with the Participant Information Sheet, followed by the consent form, before the experiment begins. Participants will be asked to confirm they

have read the information sheet, have had the opportunity to ask the researchers any questions, and any questions asked have been sufficiently answered. They will also be asked to confirm they have received enough information about the study, they understand they are able to withdraw from the study at any time, and that they wish to participate in the study. Due to the anonymised nature of the study, these statements will require a forced tick box whereby they will not be able to participate if they do not tick all statements. Participants will not be able to continue on with the experiment if they do not provide consent.

A copy of the consent form can be found in the appendix section of this application.

If participants are to be recruited from any of potentially vulnerable groups, <u>give details of extra steps</u> taken to assure their protection. Describe any arrangements to be made for obtaining consent from a legal representative.

N/A

Copies of any written consent form, written information and all other explanatory material should accompany this application*. The information sheet should make explicit that participants can withdraw from the research at any time, if the research design permits. Remember to use meaningful file names and version control to make it easier to keep track of your documents.*

D.6 Describe whether participants will be able to withdraw from the study, and up to what point (e.g. if data is to be anonymised). If withdrawal is <u>not</u> possible, explain why not.
Any limits to withdrawal, e.g. once the results have been written up or published, should be made clear to participants in advance, preferably by specifying a date after which withdrawal would not be possible. Make sure that the information provided to participants (e.g. information sheets, consent forms) is consistent with the answer to D6.

Participants will be able to withdraw at any point whilst completing the experiment. However, once they have submitted their responses to the experiment then they will not be able to withdraw their data. This is because the study is completely anonymised, and the researcher would be unable to link their identity to their data. The Participant Information Sheet will explain to participants their right to withdraw at any point, without penalty, and that their data will be anonymous.

D.7 How long will the participant have to decide whether to take part in the research?
It may be appropriate to recruit participants on the spot for low risk research; however consideration is usually necessary for riskier projects.

Participants will have the opportunity to read the information about the study on SONA and follow a link to the full Participant Information Sheet before they decide whether they wish to participate. They will then be able to sign up to the study at any time and cancel with 24 hours' notice.

D.8 What arrangements have been made for participants who might have difficulties understanding verbal explanations or written information, or who have particular communication needs that should be taken into account to facilitate their involvement in the research? *Different populations will have different information needs, different communication abilities and different levels of understanding of the research topic. Reasonable efforts should be made to include potential participants who could otherwise be prevented from participating due to disabilities or language barriers.*

Participants will be welcome to ask any questions, at any point, that may clarify any aspects of the study that they do not understand. However, the exclusion criteria outlined in section D.2 will need to be applied.

D.9 Will individual or group interviews/ questionnaires discuss any topics or issues that might be sensitive, embarrassing or upsetting, or is it possible that criminal or other disclosures requiring action could take place during the study (e.g. during interviews or group discussions)? *The information sheet should explain under what circumstances action may be taken.*

X	Yes		No

If yes, give details of procedures in place to deal with these issues.

These issues and procedures have been outlined in section B.5.

D.10 Will individual research participants receive any payments, fees, reimbursement of expenses or any other incentives or benefits for taking part in this research?

X	Yes		No

If Yes, please describe the amount, number and size of incentives and on what basis this was decided.

Participants will receive 1 credit as part of the Research Skills modules.

PART E: RESEARCH INVOLVING HUMAN TISSUES OR MATERIAL (leave blank if not applicable)

E.1 Will the research involve the use of any of the following? (Mark with X as appropriate)

- [ ] Foetal material
- [ ] The recently deceased
- [ ] Cadavers
- [ ] Human bodily fluid
- [ ] Human tissue
- [ ] Human organs
- [ ] Human gametes

Go to Section F if the research does not involve any of the above material.

E.2 Will the material to be accessed be collected as part of this study or 3rd party accessed (E.g. material collected as part of another study or purchased)?

If yes to 3rd party access, please provide details on appropriate consent for this use.

E.3 What type of tissue or material will be collected?

E.4 How will the tissue or material be collected and who will do this?

E.5 How many samples will be collected?

E.6 How long will samples be stored?

E.7 Do you require a regulatory licence to use or store this material?

	Yes		No

All material is expected to be stored in line with the Human Tissue Authority storage expectations.

E.8 Do you have the appropriate Health and Safety procedures in place for the researchers to handle the samples?

	Yes		No

PART F: RESEARCH DATA

F.1 Explain what measures will be put in place to protect personal data. E.g. anonymisation procedures and coding of data. Any potential for re-identification should be made clear to participants in advance.

Personal data will consist of names and signatures written on the consent form, and the participant's age and gender entered into the Qualtrics script. Consent forms will be stored in locked filing cabinets in the Research Supervisor's office and kept separate from research data. Each participant will be given a participant number as part of the Qualtrics file. It will not be possible to identify individual participants from the electronic data.

F2. What security measures are place to ensure secure storage of data at any stage of the research?

Provide details on where personal data will be stored, any of the following: (mark with X all that apply)

	University approved cloud computing services
	Other cloud computing services
X	Manual files
	Private company computers
	Portable devices
	Home or other personal computers (not recommended; data should be stored on a University of Hull server such as your G,T, X or Z: drive where it is secure and backed up regularly).

Please attach the data management plan in the appendices; for further information visit http://libguides.hull.ac.uk/researchdata

F.3 Who will have access to participant's personal data during the study?

The only personal data collected from participants will be their name, signature and information about their gender and age. Those who will have access to this information will be the researcher (Beth Markham) and both supervisors (Professor Steve Dewhurst and Dr Rachel Anderson). However participants will not be identifiable from this information because all data will be anonymised.

F.4 Where will the data generated by the research be analysed and by whom?

The data will be analysed using SPSS, which will be conducted by the investigators on either their own personal computer or university computers.

F.5 Who will have access and act as long term custodian for the research data generated by the study?

Professor Stephen Dewhurst (Supervisor) will act as long-term custodian.

F.6 Have all researchers that have access to the personal data that will be collected as part of the research study, completed the University (or equivalent) data protection training?

[X] Yes [ ] No

It is mandatory that all researchers accessing personal data have completed data protection training prior to commencing the research.

F.7 Will the research involve any of the following activities at any stage (including identification of potential research participants)? (Select all that apply)

- [ ] Examination of personal records by those who would not normally have access
- [ ] Access to research data on individuals by people from outside the research team
- [ ] Electronic surveys, please specify survey tool: _____
- [X] Other electronic transfer of data
- [ ] Use of personal addresses, postcodes, faxes, e-mails or telephone numbers
- [ ] Use of audio/ visual recording devices (NB this should usually be mentioned in the information for participants)

F.8 Are there any reasons to prevent or delay the publication of this research? E.g. Commercial embargoes, sensitive material.

[ ] Yes [X] No

If yes, provide details:

F.9 Where will the results of this study be disseminated ? (Select all that apply)

- [ ] Conference presentation
- [ ] Peer reviewed journals
- [ ] Publication as an eThesis in the Institutional repository HYDRA
- [ ] Publication on website
- [X] Other publication or report, please state: MRes Thesis
- [ ] Submission to regulatory authorities
- [ ] Other, please state: _____ _____.

☐ No plans to report or disseminate the results

F.10 How long will research data from the study be stored?

10 years

F.11 When will the personal data collected during the study be destroyed and how?

All data collected will be anonymised once participants begin the experiment. Personal information such as age and gender will be collected, however these will be linked to a participant number after completion of the experiment. As a result, participants will not be identifiable due to the anonymisation process.

Researchers must comply with the General Data Protection Regulations that are live from May 2018.

PART G: CONFLICTS OF INTEREST

G.1 Will any of the researchers or their institutions receive any other benefits or incentives for taking part in this research over and above normal salary or the costs of undertaking the research?

☐ Yes ☒ No

If yes, indicate how much and on what basis this has been decided

G.2 Is there scope for any other conflict of interest? *For example, could the research findings affect any ongoing relationship between any of the individuals or organisations involved and the researcher(s)? Will the research funder have control of publication of research findings?*

☐ Yes ☒ No

If so, please describe this potential conflict of interest, and outline what measures will be taken to address any ethical issues that might arise from the research.

G.3 Does the research involve external funding? (Tick as appropriate)

☐ Yes ☒ No

If yes, what is the source of this funding?

PART H: TRAINING

Please provide details of any training required to conduct this research by any member of the research team. The researcher has attended the 'Research Integrity' workshop as part of 'The Modern Researcher 1: Essential Skills, Knowledge and Training' module for the Postgraduate Training Scheme. The supervisor and co-supervisor are both experienced researchers.

PART I: DECLARATIONS

Declaration by Principal Investigator

1 The information in this form is accurate to the best of my knowledge and belief.

2. I take full responsibility for the information I have supplied in this document.

3. I undertake to abide by the University's ethical and health and safety guidelines, and the ethical principles underlying good practice guidelines appropriate to my discipline.

4. I will seek the relevant School Risk assessment/COSHH approval if required.

5. If the research is approved, I undertake to adhere to the project protocol, the terms of this application and any conditions set out by the Faculty Research Ethics Committee.

6. Before implementing substantial amendments to the protocol, I will submit an amendment request to the Faculty Research Ethics Committee seeking approval.

7. If requested, I will submit progress reports.

8. I am aware of my responsibility to be up to date and comply with the requirements of the law and relevant guidelines relating to security and confidentiality of participants or other personal data, including the need to register when necessary with the appropriate Data Protection Officer.

9. I understand that research records/data may be subject to inspection for audit purposes if required in future.

10. I take full responsibility for the actions of the research team and individuals supporting this study, thus all those involved will be given training relevant to their role in the study.

11. By signing the validation I agree that the Faculty Research Ethics Committee, on behalf of the University of Hull, will hold personal data in this application and this will be managed according to the principles established in the Data protection Act (1998).

Sharing information for training purposes: Optional – please mark with X as appropriate:

x	I would be content for members of other Research Ethics Committees to have access to the information in the application in confidence for training purposes. All personal identifiers and references to researchers, funders and research units would be removed.

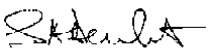
Principal Investigator

Signature of Principal Investigator: 

(This needs to be an actual signature rather than just typed. Electronic signatures are acceptable)

Print name: Beth Markham Date: 26/10/2022

Supervisor of student research: I have read, edited and agree with the form above.

Supervisor's signature: 

(This needs to be an actual signature rather than just typed. Electronic signatures are acceptable)

Print name: Prof Steve Dewhurst Date: (dd/mm/yyyy): 26/10/2022

Remember to include any supporting material such as your participant information sheet, consent form, interview questions and recruitment material with your application. Version control should be adopted to include the version number and date on relevant documents in the appendices.

These should be pasted as Appendices to this form.
Multiple documents will not be accepted.

Please submit your form **by email** to FHS-ethicssubmissions@hull.ac.uk

Appendix B: risk assessment submitted for experiment 1.

UNIVERSITY OF HULL | FACULTY OF HEALTH SCIENCES

FHS RESEARCH ETHICS COMMITTEE

RISK ASSESSMENT

Title of the research	Gender differences in schema-driven false memories.
Name of Principal Investigator	Professor Steve Dewhurst §
Location of research	University of Hull

Brief description of research activity

Participants will first be presented with the Patient Health Questionnaire (PHQ-8). They will then be presented with four schema-based scenarios. Two scenarios will be emotionally neutral (e.g., a train ride and a trip to the supermarket), and two scenarios will be emotionally negative (e.g., going to hospital and being in an exam). A list of words will be presented, and participants will be asked to rate how relevant they are to each scenario. A filler task will then be given to participants (e.g., spot the difference task). To follow this, participants will complete a recognition test of words including studied and unstudied words from each scenario previously presented. The frequency of participants falsely recognising words will be measured.

RISK IDENTIFICATION

Please identify all risks related to this research and indicate WHO is at risk and the measures that are in place or are required to mitigate these.

RISK(S)	**MEASURES IN PLACE / REQUIRED** *(e.g. alternative work methods, training, supervision, protective equipment)*
Training / supervision: *(e.g. information or training required, level of experience, supervisor's input and oversight)*	The day-to-day management of the project will be conducted by the researcher, who has completed the Data Protection Training necessary. The supervisor and co-supervisor are both experienced researchers.
Location: *(e.g. remote area, laboratory, confined space, entry or exit, level of illumination, heating etc.)*	The study will be conducted on University of Hull premises, in the research labs within the Department of Psychology housed in the Applied Sciences 3 building.
Research processes: *(e.g. use of electrical systems, gas, liquids, tissue, potential for contamination, flammability etc.)*	The research makes use of e-prime on university computers, which poses minimal risks.
Equipment use: *(e.g. manual handling, operation of emergency controls etc.)*	There are no known risks associated with the equipment being used.

Violence / upset / harm: *(e.g. potential for violence, sensitivity of topic, previous incidents etc.)*	Participants will be presented with the Patient Health Questionnaire – 8 (PHQ-8), which may create/reinforce some negative thoughts or feelings. Also, there is the presentation of words negative in valence relating to both the neutral and negative schema-driven scenarios. These may cause feelings of sadness or anxiety. Participants will be informed of the nature of the tasks and stimuli in the Participant Information Sheet. The information sheet and debrief sheet will direct them to sources of support (The Samaritans, Shout, university wellbeing service), should they feel the need to discuss any issues in confidence.

UNIVERSITY OF HULL | FACULTY OF HEALTH SCIENCES

CONTINUED…..	
Individuals: *(e.g. medical condition, young, inexperienced, disability etc.)*	No known risks. All participants will be undergraduate students from the Psychology student population at the University of Hull.
Work patterns: *(e.g. lone working, working out of hours, working off site, isolated or remote location etc.)*	Work will be conducted during standard university working hours, within the research labs in the Department of Psychology, Applied Science 3 building.
Other:	None

Name of Principal Investigator:	Beth Markham
Signature:	BMarkham
Date:	10/10/2022
Name of Supervisor (if relevant):	Prof Steve Dewhurst
Signature:	SDewhurst
Date:	10/10/2022

Appendix C: data management plan submitted for experiment 1.

UNIVERSITY OF HULL

University of Hull

Faculty of Health Sciences

Data Management Plan

(NB: This form should be completed at the start of all projects where data are not being stored in alternative sources, eg Clinical Trial Data held in the NHS). Shaded areas are considered essential.

Date	10/10/2022
Researcher(s)	Beth Markham Professor Steve Dewhurst Dr Rachel Anderson Department of Psychology
Project title	Gender differences in schema-driven false memories.
Brief description	Participants will be presented with four schema-based scenarios. Two scenarios will be emotionally neutral (e.g., a train ride and a trip to the supermarket), and two scenarios will be emotionally negative (e.g., going to hospital and being in an exam). A list of words will be presented, and participants will be asked to rate how relevant they are to each scenario. A filler task will then be given to participants (e.g., spot the difference task). To follow this, participants will complete a recognition test of words including studied and unstudied words from each scenario previously presented. The frequency of participants falsely recognising words will be measured. Participants will also be presented with the Patient Health Questionnaire (PHQ-8) as a measure of their current mood.

For detailed, updated explanations of the various parts of the document that require completion, please refer to the accompanying Appendices.

Contents

Section 1: Project Information

Project title: Gender differences in schema-driven false memories.
1.1 Project duration 10/10/2022 – 28/05/2023
1.2 Partners (if applicable) N/A
1.3 Brief description
1.4 Faculty or University requirements for data management Completion of data management plan prior to commencement of the research.
1.5 Funding body(ies) N/A
1.7 Budget (estimate if necessary) N/A
1.8 Funding body requirements for data management N/A

Section 2: Data, Materials, Resource Collection Information

2.1 Brief description of data sources Personal data • Name and signature on the consent forms, age and gender in the Qualtrics file. Research data • Ratings for relevance of words to negative and neutral scenarios, and scores on recognition task.
2.2 Data collection process Names, signatures, ages (in years) and gender will be collected at the start of the experiment. The research data will be collected in room 252 in the Applied Sciences 3 building, using Qualtrics experiment generator software.
2.3 Will data be available in electronic format (if so then state format(s))? Electronic data will consist of age in years, gender, word ratings, and scores for the recognition test in Qualtrics files. These will be imported to Microsoft Excel for data collection. Means will be analysed in SPSS.
2.4 Will the data be available in hard copy (if so then state format(s))? The paper consent forms will be held in a locked cabinet in the research supervisor's office at the Unviersity of Hull. These will contain the name, signature, age and gender of the participant. It will not be possible to link the consent forms to the electronic data files.
2.5 Will the data stand alone and be comprehensible to a third party or be accompanied by explanatory documentation? Anonymized data will consist of the individual participant's age in years, gender, and data on the word rating task, scores on the recognition test, and scores on the PHQ-8.
2.6 Describe quality assurance process for data management Raw data will be stored on password-protected PCs. Electronic data will be analysed within one month of collection and means will be saved as SPSS files.

Section 3: Ethics, Intellectual Property

3.1 How have the ethical aspects of data storage and subsequent access been addressed? - The personal information included on the consent forms (name, signature, age and gender) will be completely confidential and securely stored. - No data held electronically will contain any personally identifiable data.
3.2 Will the data comply with relevant legislation such as Data Protection Act, Copyright and Intellectual Property? Yes. - Only relevant data will be collected and stored appropriately. - Data will be kept confidentially and use codes. - Data will be collected directly from participants so will be accurate. - The data will be kept for 10 years after completion of the project and will be stored appropriately for this duration. - Electronic data will be stored in password protected documents and saved on the researcher's encrypted desktop. Once the study is completed, the research data will be held on secure drives at the University of Hull for 10 years, under the custody of the PI. Data will not be transferred to countries outside of the EEA.
3.3 If several partners are involved how will compliance with 3.2 be assured? N/A

Section 4: Access and Use of Information

4.1 Are you required, and with whom, to share the data subsequent to completion of the project? The analysed data will be written in a report and will be submitted for completing of the researcher's MRes Research Methods in Psychology course.
4.2 If 'yes' to 4.1, in what format will data be shared? The research findings will be submitted as the researcher's thesis. It is not intended that raw data sets will be shared.
4.3 Will the data have to be stored for a specific period (if so, how long)? 10 years
4.4 Who may need to have access to the data? The researcher will have access to the data for the analysis and write up of the project. The supervisor will also have access to the data.
4.5 How do you anticipate the data being used subsequent to the project? It is not anticipated that the raw data will need to be used once it has been analysed.

Section 5: Storage and Backup of Data

5.1 Where and how will the data be stored **during the lifespan of the project?** Hardcopy Hardcopy of data (consent forms) will be stored in the research supervisor's office at the University of Hull, in a locked cabinet. Electronic Electronic files (age, gender, word ratings, recognition test scores) will be password protected and saved on the researcher's encrypted desktop.
5.2 Where and how will the data be stored **on completion of the project?** Hardcopy Hardcopy of data (consent forms) will be stored in the research supervisor's office at the University of Hull, in a locked cabinet. Electronic Electronic files (age, gender, word ratings, recognition test scores) will be password protected and saved on the researcher's encrypted desktop.
5.3 What provision is being made for backup of the data? Electronic data will be backed up onto secure University drives for the duration of the project.
5.4 Will different version of the data be stored? No.

Section 6: Archiving and Future Proofing of Information

6.1 What is the long-term strategy for storage and availability of the data? Long-term storage will be on secure University drives under the custody of the supervisor.
6.2 Will the information be kept after the life of the project, for how long and in what format? Data will kept for 10 years after the completion of the project in the following format: <u>Hardcopy</u> Hardcopy of the data (consent forms) will be stored in the office of the supervisor at the University of Hull, in a locked cabinet. <u>Electronic</u> Electronic files (age, gender, word ratings, recognition test scores) will be stored at the University of Hull on secure drives under the control of the research supervisor.
6.3 If the data include confidential or sensitive information, how will these data be managed? All data will be confidential and codes will be allocated to participants which will be used on each piece of data. Electronic data will be password protected and stored on the researcher's encrypted desktop for the duration of the project.
6.4 If meta data or explanatory information is to be stored, how will this be linked to the data? Each data set will have attached an explanatory note to advice the content of the data and details of the study it related to.
6.5 How will the data be cited? N/A

Section 7: Resourcing of Data Management

7.1 List the specific staff who will have access to the data and denote who will have the responsibility for data management. The researcher will have responsibility for data management. The hard copies of data (consent forms) will be stored in a locked cabinet in the office of the research supervisor.
7.2 How will data management be funded? By the University of Hull.
7.3 How will data storage be funded? No additional costs of storage are anticipated and data will be held on University secure drives for the prescribed storage period.

Section 8: Review of Data Management process

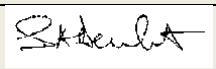
8.1 How will the data management plan be adhered to? All steps of the plan have been outlined by the researcher prior to commencing the project and will be implemented throughout the project by the researcher and supervisor.
8.2 Who will review the data management plan? The research supervisor.

Section 9: Statements and Personnel Details

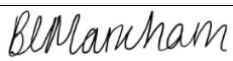
9.1 Statement of agreement

I/we agree to the specific elements of the plan as outlined:

Principal investigator or PhD supervisor

Title	Professor
Designation	
Name	Stephen Dewhurst
Date	26.10.2022
Signature	

Researcher

Title	Miss
Designation	
Name	Beth Markham
Date	26.10.2022
Signature	

Researcher

Title	
Designation	
Name	
Date	
Signature	

Researcher

Title	
Designation	
Name	
Date	
Signature	

Researcher

Title	
Designation	
Name	
Date	
Signature	

9.2 Expertise of Researchers

Title	
Name	
Contact Details	
Expertise	

Title	
Name	
Contact Details	
Expertise	

Title	
Name	

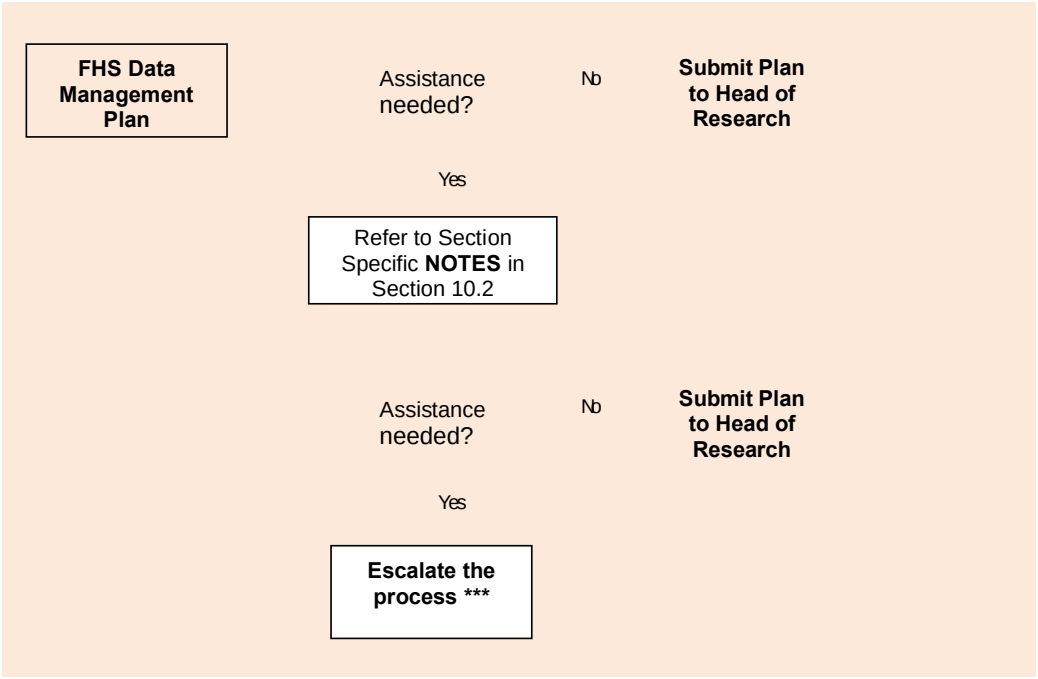
Contact Details	
Expertise	

Title	
Name	
Contact Details	
Expertise	

Section 10: Appendices

10.1 Specific Help with completing the Plan

In certain instances, specific guidance may be required in order to complete this Data Management Plan. Assistance should be sought by following the flow chart below:



Escalate the process by requesting assistance from the Departmental Head of Research. Typically this will entail contacting the Data Manager, IT Services and/or Library Services. Specific assistance may be available through the Research Office as well.

10.2 Notes

These notes refer to the specified sections and subsections in this document. Any areas not addressed may be referred to the project lead, supervisor, or the Head of Research. Technical issues may be addressed to the HDMP development team in the first instance.

Front Cover

Details are required to ensure the correct future referencing, storage and archiving of the Data Management Plan. There will be strict adherence to applicable law, including the Data Protection Act; this information will not be made available outside of the specific remit of the Faculty of Health and Social Care of the University of Hull.

Section 1: Project Information

1.1 No specific guidance available

1.2 No specific guidance available

1.3 Required for funded projects – this refers to organisations other than the University of Hull

1.4 If necessary, further information may be provided on an attached, clearly labelled **typed** or **printed** sheet. For online forms, the space will automatically be increased to accommodate extra text.

1.5 State what local requirements are in place – details from Head of Research

1.6 Details may be requested from the project Supervisor, or the Head of Research.

1.7 Applies specifically to funded projects. If necessary, further information may be provided on an attached, clearly labelled **typed** or **printed** sheet. For online forms, the space will automatically be increased to accommodate extra text.

1.8 Applies specifically to funded projects. If necessary, further information may be provided on an attached, clearly labelled **typed** or **printed** sheet. For online forms, the space will automatically be increased to accommodate extra text. Details may be requested from the project Supervisor, or the Head of Research.

Section 2: Data, Materials, Resource Collection Information

2.1 If necessary, further information may be provided on an attached, clearly labelled, **typed** or **printed** sheet. For online forms, the space will automatically be increased to accommodate extra text. NOTE: details may change as the project evolves; provide a best estimate.

2.2 If necessary, further information may be provided on an attached, clearly labelled **typed** or **printed** sheet. For online forms, the space will automatically be increased to accommodate extra text.

2.3 It is vital that there is a clear understanding of exactly which data types are being discussed in order to plan for future storage, accessibility and integrity. Example data types and formats are available at http://en.wikipedia.org/wiki/Listoffileformats.

2.4 A great deal of non-digital data may need to be stored securely and/or archived. Various examples of this type of data are:

- Documents: Printed digital, Original artefact, etc.
- Images: Photographs (size, print type, age), posters, etc.
- Artefacts: Physical model (scale/non-scale, size, availability), archaeological, etc.
- Film: 8/16/32mm, Video, microfilm, negative, etc.

- Other: Live performance, logical model, etc.

2.5 "Standalone" implies a provided information resource that requires no further explanation and may be used "as is" without additional resource. Accompanied implies information that is informed by accompanying documentation or resource(s) which help to understand the resource. For example, a database may need to be accompanied by a "metadata" informative document which explains the purpose, use of specific fields, and instructions for utilisation. Details may be requested from the project Supervisor, or the Head of Research.

2.6 Quality Assurance/Management in this context refers to the concise provision of a breakdown of what will be done to ensure that the project's progress will be monitored for accuracy, quality of work or research, and timely delivery at regular intervals. Typically, this would be the remit of the Research Supervisor, the Project Lead, or the Head of Department. Details may be requested from the project Supervisor, or the Head of Research.

Section 3: Ethics, Intellectual Property, Citation

3.1 If your research has an impact on the welfare, confidentiality or economic status of any individual or corporate group, this should be clearly stated. If necessary, further information may be provided on an attached, clearly labelled **typed** or **printed** sheet. For online forms, the space will automatically be increased to accommodate extra text. **NOTE**: details may change as the project evolves; provide a best estimate.

3.2 It is vital to comply with applicable law. Provide a brief outline of how relevant legislation and regulations will be complied with where appropriate. Where there is any doubt, the first line of contact is the project Supervisor, or the Head of Research.

3.3 See note 3.2 above. Partners in the project must be held to the same legal and regulatory standards. Partners are also protected by applicable law and may avail themselves of the prospect of legal recourse in the event of any perceived illegality or infringement by any party. This applies to all participants effecting or affected by the research project. Where there is any doubt, the first line of contact is the project Supervisor, or the Head of Research.

Section 4: Access and Use of Information

4.1 Sharing data, i.e. making it publically available, may be a requirement of a funding bid, or of a University research project (e.g. Doctoral thesis or research project). Details may be requested from the project Supervisor, or the Head of Research.

4.2 Provide details of how you intend to share your data (if relevant). This may include several options, such as an online accessible dataset or database, or online images. It could also be in the form of a paper based document or set of documents. If you are uncertain, or wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

4.3 If your data are sensitive (e.g. not suitable for general access until you have completed, or contains personal data or information) you may need to keep the data secure until you are ready to publish – if at all. Similarly, if the project funder requires "mile-stone" releases, this should be indicated. If in doubt, check this with the project Supervisor, or the Head of Research.

4.4 It is vital that you have a clear perspective of who the outcome of your research is intended to reach. Funding bodies may stipulate specific outcomes – e.g. public access, etc.

4.5 Funding bodies will typically require an explanation of the usefulness of your research once completed, and you should be able to provide a clear idea of what will be done with your data once published or released. Certain obvious options should not be overlooked, such as: paper presented at conference for history community, or book chapter published for community and public research/interest, etc.

Section 5: Storage and Backup of Data

5.1 It is vital that the research materials and data are kept *safely at every stage* of the research process lifespan. There may be help available from IT Services, the Library or the Department. If you are uncertain, or wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

5.2 As for 5.1 above, it is vital that you have a clear understanding of how, where and when the research materials and data will be maintained after research process lifespan. This is particularly true where funding bodies have specific outcome criteria (e.g. making a public website available, etc.). There may be help available from IT Services, the Library or the Department. If you are uncertain, or wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

5.3 Similarly to 5.1 and 5.2 above, it is vital that you have a clear understanding of how, where and when the research materials and data will be backed up and kept safely, both during and after the after the research process lifespan. This is particularly true where funding bodies have specific outcome criteria (e.g. ensuring that online datasets are maintained for a specific period after the end of a project, etc.). There may be help available from IT Services, the Library or the Department. If you are uncertain, or wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

5.4 Very often work is added to, revised or altered and older versions are either overwritten, left as they were, or deleted. It may be wise to maintain a clearly labelled and stored set of older versions of current work in order to backtrack if necessary. Itis imperative that a logical and sequenced filing system is used. On computer systems this may be attained by uniquely numbering each version. A useful means of achieving this is by using the current date and time as the unique numbering reference – e.g. “yyyymmdd FHS Data Management Plan”.

Section 6: Archiving and Future Proofing of Information

6.1 Provide information about how you intend for the project outcome(s) or deliverable(s) to be maintained after the end of the project. For example, a dataset may be perpetually maintained by the University’s online provision. However, this will need to be confirmed. There may be help available from IT Services, the Library or the Department. If you are uncertain, or wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

6.2 Any information that is kept after the lifespan of a project will still need to be stored safely, maintained and be provided in a useable format. If specific file formats are used, they may become unusable after a few years as new software replaces the old. Also, media such as DVDs, CDs and diskettes may become unusable after a while. There may be help available from IT Services, the Library or the Department. If you are uncertain, or wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

6.3 It is vital that any confidential data (e.g. personal information about any individual who is protected under the terms of the Data Protection Act, or information that may infringe copyright if released, etc.) must be kept and maintained in a secure environment. All reasonable steps should be taken to ensure the safety of such information. This applies to any information that is kept after the lifespan of a project as well. If you are uncertain, or wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

6.4 Datasets, databases, standalone documents, and even artefacts may prove useless without explanatory notes (metadata) accompanying them. These materials need to be clearly linked to the materials so that they can adequately inform any future user about the material. For example, a published dataset will typically be accompanied by a metadata document that explains the various fields, their usefulness and summarises the purpose of the dataset in general. These documents will be stored along with the dataset and are accessible in the same manner as the dataset (e.g. online, or download). Examples of such accompanying documentation are available for download. If you wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

6.5 Typically, any stored data, materials, artefacts, etc. will need to be cited when accessed and referenced by other researchers. It is useful to provide clear and concise citation information for researchers to access. This can be done via the accompanying documentation (metadata) indicated in 6.4 above. If you wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

Section 7: Resourcing of Data Management

7.1 In the event that this is an individual project or piece of research, your own name should be listed. Include any other staff or assistants are to be involved in the project as well. It may be necessary to include staff from other departments of the University. If you are uncertain, or wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

7.2 Funding strategies are often outlined by funders and will include a data management aspect. The costs of any materials, equipment and specialist knowledge will need to be factored to arrive at a reasonable estimate. Include any materials or equipment that will be funded by the University and/or you. If you are uncertain, or wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

7.3 As in 7.2 above, funding strategies are often outlined by funders and will include a data management aspect. Typically the University will support on-going research projects, and assist in facilitating post project maintenance and/or presence of outputs. However, this needs to be confirmed to ensure that the service will be available in the form that is required. If you are uncertain, or wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

Section 8: Review of Data Management process

8.1 Funders will need to be informed about how the data management process will be implemented. Provide specific information about how you intend to follow through with the commitments and processes that have been discussed in the rest of this document. Typically, regular reviews, reports and assessments of progress will suffice, but some funders may require specific means of identifying adherence to the plan. If you are uncertain, or wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

8.2 Based on 8.1 above, list those who will be carrying out the reviews and subsequent reports or processes necessary to ensure the successful implementation and completion of the data management plan. Typically, in the event of smaller research projects or individual research, the project Supervisor will fill this role. In the event of PhD research, this role will be carried out by the PhD Supervisor(s). If you are uncertain, or wish to explore this avenue further, the first line of contact is the project Supervisor, or the Head of Research.

Section 9: Statements and Personnel Details

9.1 The Statement of Agreement is necessary to clarify the areas of responsibility and work that will be carried out by the various researchers engaged in the project. This information is vital for funding bodies that will require these details.

9.2 As in 9.1 above, the Expertise of Researchers is necessary to clarify the areas of responsibility and work that will be carried out by the various researchers engaged in the project. This information is vital for funding bodies that will require these details in the form of a brief résumé for each researcher.

Section 10: Appendices

10.1 Assistance with completing the Plan; follow the instructions to obtain help specific to each section.

10.2 Follow the guidance for each specific section as necessary.

10.3 This list of Relevant Contacts will be reviewed and altered regularly.

10.3 Relevant Contacts

The following list of contacts will be regularly revised as appropriate:

Head of Research	
Library and Learning Innovation	Chris Awre Head of Information Management Phone: +44 (0) 1482 465441 Email: c.awre@hull.ac.uk
ICT Directorate	IT Helpdesk Phone: +44 (0)1482 462010 E-mail: help@hull.ac.uk
Head of School	
Document Author	Chris Awre Details as above

Appendix D: 'Notice of Substantial Amendment' form submitted for experiment 1.

FHS RESEARCH ETHICS COMMITTEE FORM C: Notice of Substantial Amendment

Principal Investigator contact details	
Name:	Beth Markham
Address:	Fenner 142
Telephone	07500947734
Email:	B.L.MARKHAM-2018@hull.ac.uk

Full title of study	Imagining hypothetical events.
REC reference number (from original authorisation letter)	FHS 22-23.15
Date study commenced	
Insert amendment number & date	Amendment number 1 – 31/10/2022

Tick all that apply	Type of amendment	Effective date for amendment
x	Changes to the design or methodology of the study, or to background information affecting its scientific value	ASAP
x	Changes to the procedures undertaken by participants; any change relating to the safety or physical or mental integrity of participants, or to the risk/benefit assessment for the study	ASAP
☐	Significant changes to study documentation such as participant information sheets, consent forms, questionnaires, letters of invitation, letters to GPs or other clinicians, information sheets for relatives or carers etc.	
☐	Appointment of a new chief investigator	
☐	Temporary halt of a study to protect participants from harm, and the planned restart of a study following a temporary halt;	
☐	A change to the definition of the end of the study	
☐	Any other significant change to the protocol or the terms of the original approved ethics application	

Is this a modified version of an amendment previously notified to the REC and given an unfavourable opinion?	○ Yes ◉ No

Summary of changes

Briefly summarise the main changes proposed in this amendment using language comprehensible to a lay person. Explain the purpose of the changes and their significance for the study.

If this is a modified amendment, please explain how the modifications address concerns raised previously by the ethics committee.

If the amendment significantly alters the research design or methodology, or could otherwise affect the scientific value of the study, indicate whether or not additional scientific critique has been obtained and enclose if appropriate.

The aim of the experiment is to investigate gender differences in susceptibility to false memories. Participants will be asked to imagine hypothetical scenarios and will then be presented with list of words describing objects and people and asked to rate the likelihood that they might encounter them in those scenarios. They will then be given a recognition test for the words they rated. In order to measure false memory, the recognition test will include items that are related to the scenarios but were not included in the rating tasks. Two of the scenarios are emotionally neutral (a train journey and a trip to the supermarket) and two are emotionally negative (a stay in hospital and an important exam). Descriptions of the scenarios to be presented to participants were included in the original ethics application, but unfortunately we did not include the most recent versions. The most recent versions of the descriptions are provided below. The main difference is that the descriptions of the two negative scenarios have been rewritten to emphasise their negativity. Nothing else about the study has changed.

NEUTRAL
Train journey
Imagine that you are about to go on a train journey. Imagine how the train will look. Think about the things you might see, the people you might meet, the passing scenery, and so on. Please spend a few moments imagining this train journey. While you are imagining this experience, I am going to present you with a list of words describing objects and people. I would like you to rate how likely it is that you each of these items would be on the train journey. For some items, it may be very likely that they will be there. For others, it may be unlikely. It is up to you to decide.

Supermarket
Imagine that you are about to go to the supermarket. Imagine how the supermarket will look. Think about the items you might buy, the people you might see, how the supermarket is laid out, and so on. Please spend a few moments imagining this trip to the supermarket. While you are imagining this experience, I am going to present you with a list of words describing objects and people. I would like you to rate how likely it is that each of these items will be at the supermarket. For some items, it may be very likely that they will be there. For others, it may be unlikely. It is up to you to decide.

NEGATIVE
Hospital
Imagine that you are about to spend some time in hospital. Imagine that you feel very worried about this. Think about the discomfort you might experience, how lonely you might feel, the boredom, and so on. Please spend a few moments imagining your time in hospital. While you are imagining this experience, I am going to present you with a list of words describing objects and people. I would like you to rate how likely it is that each of the items would be at the hospital. For some items, it may be very likely that they would be there. For others, it may be unlikely. It's up to you to decide.

Exam
Imagine that you are about to take an exam for which you feel completely unprepared. Think about how nervous you would be, the worry that you might have revised the wrong topics, the importance of doing well, and so on. Please spend a few moments imagining this exam. While you are imagining this experience, I am going to present you with a list of words describing objects and people. I would

like you to rate how likely it is that these items would be at the exam. For some objects, it may be very likely that they would be there. For others, it may be unlikely. It's up to you to decide.

Any other relevant information

Applicants may indicate any specific ethical issues relating to the amendment, on which the opinion of the ethics committee is sought.

List of attached documents (these should be added to the end of this document)

Document	Version	Date

DECLARATIONS:

I confirm that the information in this form is accurate to the best of my knowledge and I take full responsibility for it.

I consider that it would be reasonable for the proposed amendment to be implemented.

Principal Investigator:

Signature of Principal Investigator: BLMarkham

(This needs to be an actual signature rather than just typed. Electronic signatures are acceptable)

Print name: Beth Markham Date: (dd/mm/yyyy) 31/10/2022

Supervisor of student research: I have read, edited and agree with the form above.

Supervisor's signature: SDewhurst

(This needs to be an actual signature rather than just typed. Electronic signatures are acceptable)

Print name: Prof Steve Dewhurst Date: (dd/mm/yyyy) 31/10/22

This application should be emailed to the ethics submission email address
FHS-ethicssubmissions@hull.ac.uk

No actions relating to the amendment should be Undertaken until approval has been obtained.

Appendix E: informed consent form for experiment 1 and 2.

UNIVERSITY OF HULL

Consent Form Version 1.1 / 26.10.2022

CONSENT FORM

Title of study: **Imagining hypothetical events**.

Name of Researcher: Beth Markham

Please initial each box if you agree with the following statements. If you do not agree with all the statements, do not complete the form and do not take part in the study. You will need to initial each box in order to be able to continue with the research study.

Please initial box

1. I confirm that I have read the information sheet Version 1.1 dated 26.10.2022 for the above study. I have had the opportunity to consider the information, ask questions and have had any questions answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason ☐

3. I understand that the research data, which will be anonymised (not linked to me), will be retained by the researchers and may be shared with others and publicly disseminated to support other research in the future. ☐

4. I understand that my personal data will be kept securely in accordance with data protection guidelines, and will only be available to the immediate research team. ☐

5. I give permission for the collection and use of my data to answer the research question in this study. ☐

6. I agree to take part in the above study. ☐

Name of Participant	Date	Signature

Appendix F: information sheet for experiment 1.

UNIVERSITY OF HULL

Participant Information Sheet Version 1.1 26.10.2022

INFORMATION SHEET FOR PARTICIPANTS

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

Title of study: Imagining hypothetical events.

Researcher: Beth Markham

You are invited to participate in a research study in which you will be asked to imagine some hypothetical scenarios. Some of these will be negative in nature and others will be emotionally neutral. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask if there is anything that is not clear or if you would like more information.

What is the purpose of the study?
The purpose of the study is to examine how people think about words in relation to negative and neutral scenarios.

Why have I been invited to take part?
You are being invited to participate in this study because research participation is a compulsory part of the Research Methods modules in your Psychology degree.

What will happen if I take part?
If you choose to take part in the study you will be presented with a series of scenarios to imagine. You will then be presented with a series of words, and your task is to rate how relevant each word is to the scenario you are imagining. These instructions will be shown again on the computer screen before the experiment begins. You will also be asked to complete a short questionnaire designed to measure your mood.

Do I have to take part?
Participation is completely voluntary. You should only take part if you want to and choosing not to take part will not disadvantage you in any way. Once you have read the information sheet, please contact me if you have any questions that will help you make a decision about taking part. If you decide to take part, I will ask you to sign a consent form and you will be given a copy of this sheet to keep. You may stop your participation for any reason during the experiment without loss of any benefits of participation. However, once you have completed the study, your data can no longer be withdrawn as the researcher will not be able to link you to your data due to it being anonymous.

Payment/Incentives
You will receive 1 research participation credit for taking part in this study.

What are the possible risks of taking part?
Some of the presented scenarios and words within the rating task will be negative. If this study raises issues for you, which you would like to discuss with anyone in confidence, then you may find the following sources of support helpful:

The Samaritans – Samaritans.org / 116 123
Shout – 85258 (text only)
Hull University Student Assistance Programme (University of Hull students only) – 0800 1380990

What are the possible benefits of taking part?
The benefits, in addition to receiving research participation credit, are that you will gain experience of laboratory research that may prove useful when conducting your own research project.

How will your information be used?
Your data will be processed in accordance with the UK-GDPR and the Data Protection Act 2018. All information collected about you (including information about your age and gender) will be kept private and confidential, and you will not be identifiable form the information your provide. The data collected within the study is wholly anonymised and will be kept confidential, safe and secure. You will be assigned a 'participant number' when you agree to take part in the study, which will be used by the researcher to organise the information gained from your responses. Once the study is finished, the data will be kept for a period of 10 years. The reports will be written in a way that no-one can work out that you took part in the study. If the research data is published, it will be in a form such that you cannot be recognised.

If information about you is published it will be in a form such that you cannot be recognized. You will be assigned a 'participant number' when you agree to take part in the study, which will be used by the researcher to organise the information gained from your responses. Your participation in the study is voluntary and you are free to choose whether or not to complete the study. You may stop the procedure for any reason during participation without loss of any benefits of participation.

Data Protection Statement
The data controller for this project will be the University of Hull. The University will process your personal data for the purpose of the research outlined above. The legal basis for processing your personal data for research purposes under GDPR is a 'task in the public interest'.

If you are not happy with the sponsor's response or believe the sponsor processing your data in a way that is not right or lawful, you can complain to the Information Commissioner's Office (ICO) (www.ico.org.uk or 0303 123 1113).

What will happen to the results of the study?
The results of the study will be summarised in a report for the researcher's thesis.

Who has reviewed this study?
Research studies are reviewed by an independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given a favourable opinion by the Faculty of Health Sciences Ethics Committee, University of Hull.

Who should I contact for further information?
If you have any questions or require more information about this study, please contact me using the following contact details:

B.L.MARKHAM-2018@hull.ac.uk

What if I have further questions, or if something goes wrong?

If you wish to make a complaint about the conduct of the study, you can contact the University of Hull using the details below for further advice and information:

In the first instance please contact Beth Markham at B.L.MARKHAM-2018@hull.ac.uk
You can also contact the research supervisor Professor Steve Dewhurst at s.dewhurst@hull.ac.uk

Alternatively please contact registrar@hull.ac.uk

Thank you for reading this information sheet and for considering taking part in this research.

Appendix G: debrief sheet for experiment 1.

UNIVERSITY OF HULL

Debrief Version 1.1 (26/10/2022)

Debriefing Information

Title of study: Imagining hypothetical events.

Researcher: Beth Markham

Thank you for taking part in this study. The participant information sheet provided you with a general overview of the aims of the current study. A more detailed description of the study is provided below. Feel free to take this information away with you and if you have any further questions then contact details for the researchers are provided below.

In the study you just took part in, you were asked to rate a series of words for how relevant they were to two negative and two neutral schema-driven scenarios. You were then given a recognition test for some of the words you rated.

The aim of the study is to investigate whether there are gender differences in false memories (erroneous scores) in the recognition test. We were unable to inform you in advance that the study is looking at gender differences in false memories, as well as informing you that you would participate in a memory test, to ensure you would focus on the rating task rather than trying to memorise the words using another strategy.

Previous research has suggested females reflect on associations in negative word lists more than males, and as a result, females are more likely to create a false memory of a negative lure. Research has also shown thinking about a particular word relating to a hypothetical event increases the likelihood of remembering that event. What we are interested in is whether there is a difference in how males and females rate the words and whether this difference influences the number of words remember or errors made by each gender.

Your results from this study are completely anonymous. The researchers do not know which responses belong to which person. If the data is published, this will remain completely anonymous.

Contacts for further information:

If you have any questions about the research then please contact Beth Markham:
B.L.MARKHAM-2018@hull.ac.uk

Or you can contact the research supervisor, Professor Steve Dewhurst:
s.dewhurst@hull.ac.uk
01482 465931

Some of the words/scenarios presented to you may trigger some negative thoughts. If this study has raised any issues for you and you would like to discuss them with someone in confidence, then you may find these mental health support services useful:

The Samaritans – Samaritans.org / 116 123
Shout – 85258 (text only)
Hull University Student Assistance Programme (University of Hull students only) – 0800 1380990

Appendix H: number wordsearch used in experiment 1 and 2.

3	0	6	3	4	6	4	1	6	3	9	~~0~~	~~3~~	~~8~~	~~6~~	~~5~~	~~2~~	2
8	1	7	0	2	6	8	8	5	4	1	8	1	0	6	1	9	3
5	7	9	1	3	4	7	7	1	5	4	9	7	2	1	2	1	4
2	6	0	9	2	5	0	2	1	7	6	5	3	6	0	5	7	0
7	0	8	1	3	9	4	5	5	7	4	8	2	6	1	4	3	8
1	2	8	2	9	6	2	3	8	6	5	2	1	8	7	0	1	5
5	3	7	8	0	4	1	4	8	9	1	6	5	1	3	7	4	6
5	0	3	3	4	0	4	9	9	0	6	9	2	8	6	5	0	8
3	8	9	6	7	8	2	4	6	1	5	2	1	4	6	1	3	1
4	1	2	9	3	5	9	4	2	3	9	4	0	2	1	9	0	7
9	4	3	7	4	1	8	0	8	4	0	3	5	4	3	4	5	1
0	2	8	7	2	9	8	2	1	8	4	1	8	6	5	9	3	8
5	4	8	0	3	1	2	0	5	9	7	3	2	6	0	1	9	0
3	2	7	0	5	7	1	9	3	2	4	1	8	1	9	4	8	9
7	0	1	3	5	8	4	5	9	1	5	2	4	9	6	4	6	5
2	9	5	6	9	1	3	2	5	2	3	8	3	9	0	9	4	2
6	4	2	8	4	6	0	7	9	4	8	6	9	1	2	6	3	0
3	1	0	3	4	8	3	7	2	8	5	0	7	5	4	1	3	7

08136	51659	~~038652~~	528353	0682131
12924	68524	186580	601814	1279451
25407	76023	264065	723578	3863007
34873	78246	362735	793482	4635394
37514	86551	467256	809520	7091204
42069	91750	518269	985042	9193064

Appendix I: full stimuli for rating task for experiment 1.

Rating task

	Negative		**Neutral**	
	Hospital	**Exam**	**Train**	**Supermarket**
Related	Bandages	Answer book	Buffet car	Alcohol
	Injection	Chair	Handrail	Basket
	Stitches	Clock	Reservation	Cashier
	Ward	Exam hall	Station	Pharmacy
	X-ray	Library card	Ticket machine	Shopping list
	Anaesthetic	Water bottle	Barriers	Cereal
	Doctor	Calculator	Newspapers	Clothes
	Medication	Invigilator	Seat	Frozen goods
	Pyjamas	Pen	Ticket	Lottery tickets
	Visitors	Ruler	Toilet	Tills
Unrelated	Lawyer	Harp	Gloves	Soldier
	Golf clubs	Scooter	Candle	Screwdriver
	Scarf	Microwave	Sofa	Skis
	Spear	Sponge	Telescope	Trainers
	Guitar	Apple	Football	Tent

Appendix J: full stimuli for recognition test for experiment 1.

Recognition test

	Negative		**Neutral**	
	Hospital	**Exam**	**Train**	**Supermarket**
Related targets	Bandages	Answer book	Buffet car	Alcohol
	Injection	Chair	Handrail	Basket
	Stitches	Clock	Reservation	Cashier
	Ward	Exam hall	Station	Pharmacy
	X-ray	Library card	Ticket machine	Shopping list
Related lures	Bed	Desk	Carriage	Bakery
	Gown	Exam paper	Guard	Checkout
	Nurses	Pencil case	Passengers	Freezers
	Painkillers	Seat number	Platform	Shoppers
	Surgeon	Students	Timetable	Trolley
Unrelated targets	Lawyer	Harp	Gloves	Soldier
	Golf clubs	Scooter	Candle	Screwdriver
Unrelated lures	Lawnmower	Mirror	Scissors	String
	Torch	Paintbrush	Plumber	Kite

Appendix K: PHQ-8 used in both experiment 1 and 2.

Patient Health Questionnaire –8 (PHQ-8)

Name:_____

Date of Birth: _____ Today's Date:_____

Over the last 2 weeks, how often have you been bothered by any of the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	☐	☐	☐	☐
2. Feeling down, depressed, irritable or hopeless	☐	☐	☐	☐
3. Trouble falling or staying asleep, or sleeping too much	☐	☐	☐	☐
4. Feeling tired or having little energy	☐	☐	☐	☐
5. Poor appetite or overeating	☐	☐	☐	☐
6. Feeling bad about yourself – or that you are a failure or have let yourself or your family down	☐	☐	☐	☐
7. Trouble concentrating on things, such as school work, reading or watching television	☐	☐	☐	☐
8. Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	☐	☐	☐	☐

Appendix L: correlation data for experiment 1.

Females

Correlations[a]

		Age	PHQ8Score	CorrectRelatedNeg	CorrectRelatedNeut	CorrectUnrelNeg	CorrectUnrelNeut	FalseRelatedNeg	FalseRelatedNeut	FalseUnrelNeg	FalseUnrelNeut
Age	Pearson Correlation	--									
	N	58									
PHQ8Score	Pearson Correlation	-.081	--								
	Sig. (2-tailed)	.545									
	N	58	58								
CorrectRelatedNeg	Pearson Correlation	-.126	-.348**	--							
	Sig. (2-tailed)	.347	.007								
	N	58	58	58							
CorrectRelatedNeut	Pearson Correlation	.014	-.103	.405**	--						
	Sig. (2-tailed)	.919	.443	.002							
	N	58	58	58	58						
CorrectUnrelNeg	Pearson Correlation	.045	-.245	.216	.305*	--					
	Sig. (2-tailed)	.740	.063	.103	.020						
	N	58	58	58	58	58					
CorrectUnrelNeut	Pearson Correlation	-.047	-.047	.103	.431**	.271*	--				
	Sig. (2-tailed)	.729	.727	.441	<.001	.039					
	N	58	58	58	58	58	58				
FalseRelatedNeg	Pearson Correlation	.146	.245	-.591**	-.575**	-.227	-.241	--			
	Sig. (2-tailed)	.274	.064	<.001	<.001	.087	.069				
	N	58	58	58	58	58	58	58			
FalseRelatedNeut	Pearson Correlation	.386**	.000	-.325*	-.274*	.084	-.253	.557**	--		
	Sig. (2-tailed)	.003	.998	.013	.037	.529	.055	<.001			
	N	58	58	58	58	58	58	58	58		
FalseUnrelNeg	Pearson Correlation	-.108	.181	-.156	-.511**	-.030	-.044	.434**	.242	--	
	Sig. (2-tailed)	.420	.173	.242	<.001	.825	.744	<.001	.067		
	N	58	58	58	58	58	58	58	58	58	
FalseUnrelNeut	Pearson Correlation	-.108	.181	-.156	-.511**	-.030	-.044	.434**	.242	1.000**	--
	Sig. (2-tailed)	.420	.173	.242	<.001	.825	.744	<.001	.067	.000	
	N	58	58	58	58	58	58	58	58	58	58

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

a. Gender = Female

Males

Correlations[a]

		Age	PHQ8Score	CorrectRelatedNeg	CorrectRelatedNeut	CorrectUnrelNeg	CorrectUnrelNeut	FalseRelatedNeg	FalseRelatedNeut	FalseUnrelNeg	FalseUnrelNeut
Age	Pearson Correlation	--									
	N	35									
PHQ8Score	Pearson Correlation	-.150	--								
	Sig. (2-tailed)	.391									
	N	35	35								
CorrectRelatedNeg	Pearson Correlation	.057	-.022	--							
	Sig. (2-tailed)	.743	.899								
	N	35	35	35							
CorrectRelatedNeut	Pearson Correlation	.002	-.239	.368*	--						
	Sig. (2-tailed)	.989	.166	.030							
	N	35	35	35	35						
CorrectUnrelNeg	Pearson Correlation	.113	-.059	-.095	.188	--					
	Sig. (2-tailed)	.520	.737	.589	.279						
	N	35	35	35	35	35					
CorrectUnrelNeut	Pearson Correlation	.008	-.073	-.118	.590**	-.075	--				
	Sig. (2-tailed)	.963	.676	.501	<.001	.667					
	N	35	35	35	35	35	35				
FalseRelatedNeg	Pearson Correlation	.060	.062	-.046	-.130	.022	-.163	--			
	Sig. (2-tailed)	.732	.724	.795	.457	.901	.348				
	N	35	35	35	35	35	35	35			
FalseRelatedNeut	Pearson Correlation	.013	.175	.154	-.108	.025	-.289	.533**	--		
	Sig. (2-tailed)	.941	.316	.377	.537	.886	.092	<.001			
	N	35	35	35	35	35	35	35	35		
FalseUnrelNeg	Pearson Correlation	-.115	.306	.005	-.436**	.112	-.267	.243	.293	--	
	Sig. (2-tailed)	.512	.074	.978	.009	.522	.121	.160	.087		
	N	35	35	35	35	35	35	35	35	35	
FalseUnrelNeut	Pearson Correlation	-.100	-.201	.066	.068	.042	.053	.092	.136	-.078	--
	Sig. (2-tailed)	.569	.247	.707	.696	.810	.764	.601	.435	.656	
	N	35	35	35	35	35	35	35	35	35	35

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

a. Gender = Male

Appendix M: 'Notice of Substantial Amendment' form submitted for experiment 2.

FHS RESEARCH ETHICS COMMITTEE FORM C: Notice of Substantial Amendment

Principal Investigator contact details	
Name:	Beth Markham
Address:	Fenner 142
Telephone	07500947734
Email:	B.L.MARKHAM-2018@hull.ac.uk

Full title of study	Imagining hypothetical events.
REC reference number (from original authorisation letter)	FHS 22-23.15
Date study commenced	
Insert amendment number & date	Amendment number 1 – 31/10/2022

Tick all that apply	Type of amendment	Effective date for amendment
x	Changes to the design or methodology of the study, or to background information affecting its scientific value	ASAP
x	Changes to the procedures undertaken by participants; any change relating to the safety or physical or mental integrity of participants, or to the risk/benefit assessment for the study	ASAP
☐	Significant changes to study documentation such as participant information sheets, consent forms, questionnaires, letters of invitation, letters to GPs or other clinicians, information sheets for relatives or carers etc.	
☐	Appointment of a new chief investigator	
☐	Temporary halt of a study to protect participants from harm, and the planned restart of a study following a temporary halt;	
☐	A change to the definition of the end of the study	
☐	Any other significant change to the protocol or the terms of the original approved ethics application	

Is this a modified version of an amendment previously notified to the REC and given an unfavourable opinion?	○ Yes ◉ No

Summary of changes

Briefly summarise the main changes proposed in this amendment using language comprehensible to a lay person. Explain the purpose of the changes and their significance for the study.

If this is a modified amendment, please explain how the modifications address concerns raised previously by the ethics committee.

If the amendment significantly alters the research design or methodology, or could otherwise affect the scientific value of the study, indicate whether or not additional scientific critique has been obtained and enclose if appropriate.

The aim of my research is to investigate gender differences in susceptibility to false memories. Participants are first asked to imagine hypothetical scenarios. They are then presented with lists of words describing objects and people and asked to rate the likelihood of encountering them in those scenarios. They are then given a recognition test for the words they rated. In order to measure false memory, the recognition test includes items that are related to the scenarios but were not included in the rating tasks. In my first experiment, two of the scenarios were emotionally neutral (a train journey and a trip to the supermarket) and two were emotionally negative (a stay in hospital and an important exam). I now wish to conduct a second experiment in which I compare positive and negative scenarios, rather than neutral and negative. The descriptions of the positive scenarios and the words from the rating task and recognition test are presented below. No other aspects of the study have changed. Participants will level 4 and level 5 Psychology students who will take part for course credit. They will not be able to take part if they have previously taken part in my first experiment.

POSITIVE SCENARIOS
Picnic
Imagine that you are about to go on a picnic. Imagine how enjoyable this would be. Think about the nice food you might eat, the games you might play, the beautiful scenery, and so on. Please spend a few moments imagining this picnic. While you are imagining this experience, I am going to present you with a list of words describing objects and people. I would like you to rate how likely it is that each of the items would be at the picnic. For some items, it may be very likely that they would be there. For others, it may be unlikely. It's up to you to decide.

Words for rating task:
Corkscrew, hikers, plates, sunshade, tablecloth, cakes, cutlery, fruit, glasses, wine

Words for recognition test:
Targets: corkscrew, hikers, plates, sunshade, tablecloth
Lures(related): blanket, drinks, hamper, napkins, sandwiches
Lures (unrelated): glue, laptop, cushion, athlete

Holiday
Imagine that you are about to go on a beach holiday abroad. Think about how excited you feel as you're packing for the holiday. Imagine yourself going sightseeing, swimming in the pool, relaxing on the beach, and so on. Please spend a few moments imagining this holiday. While you are imagining this experience, I am going to present you with a list of words describing objects and people. I would like you to rate how likely it is that each of the items would be at the holiday. For some items, it may be very likely that they would be there. For others, it may be unlikely. It's up to you to decide.

Words for rating task:
Beach towel, guidebook, shorts, sunblock, toiletries, air tickets, hotel details, sandals, sunglasses, travel plug

Words for recognition test:
Targets: beach towel, guidebook, shorts, sunblock, toiletries

Lures (related): currency, passport, suitcase, swimwear, tourists Lures (unrelated): chalk, hammer, iron, guitar

Any other relevant information

Applicants may indicate any specific ethical issues relating to the amendment, on which the opinion of the ethics committee is sought.

List of attached documents (these should be added to the end of this document)

Document	Version	Date

DECLARATIONS:

I confirm that the information in this form is accurate to the best of my knowledge and I take full responsibility for it.

I consider that it would be reasonable for the proposed amendment to be implemented.

Principal Investigator:

Signature of Principal Investigator: BLMarkham

(This needs to be an actual signature rather than just typed. Electronic signatures are acceptable)

Print name: Beth Markham Date: (dd/mm/yyyy) 13/1/2023

Supervisor of student research: I have read, edited and agree with the form above.

Supervisor's signature:

(This needs to be an actual signature rather than just typed. Electronic signatures are acceptable)

Print name: Prof Steve Dewhurst Date: (dd/mm/yyyy) 13/1/23

This application should be emailed to the ethics submission email address FHS-ethicssubmissions@hull.ac.uk

No actions relating to the amendment should be Undertaken until approval has been obtained.

Appendix N: information sheet for experiment 2.

UNIVERSITY OF HULL

Participant Information Sheet Version 1.1 26.10.2022

INFORMATION SHEET FOR PARTICIPANTS

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

Title of study: Imagining hypothetical events.

Researcher: Beth Markham

You are invited to participate in a research study in which you will be asked to imagine some hypothetical scenarios. Some of these will be negative in nature and others will be positive. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask if there is anything that is not clear or if you would like more information.

What is the purpose of the study?
The purpose of the study is to examine how people think about words in relation to negative and positive scenarios.

Why have I been invited to take part?
You are being invited to participate in this study because research participation is a compulsory part of the Research Methods modules in your Psychology degree.

What will happen if I take part?
If you choose to take part in the study you will be presented with a series of scenarios to imagine. You will then be presented with a series of words, and your task is to rate how relevant each word is to the scenario you are imagining. These instructions will be shown again on the computer screen before the experiment begins. You will also be asked to complete a short questionnaire designed to measure your mood.

Do I have to take part?
Participation is completely voluntary. You should only take part if you want to and choosing not to take part will not disadvantage you in any way. Once you have read the information sheet, please contact me if you have any questions that will help you make a decision about taking part. If you decide to take part, I will ask you to sign a consent form and you will be given a copy of this sheet to keep. You may stop your participation for any reason during the experiment without loss of any benefits of participation. However, once you have completed the study, your data can no longer be withdrawn as the researcher will not be able to link you to your data due to it being anonymous.

Payment/Incentives
You will receive 1 research participation credit for taking part in this study.

What are the possible risks of taking part?
Some of the presented scenarios and words within the rating task will be negative. If this study raises issues for you, which you would like to discuss with anyone in confidence, then you may find the following sources of support helpful:

The Samaritans – Samaritans.org / 116 123
Shout – 85258 (text only)
Hull University Student Assistance Programme (University of Hull students only) – 0800 1380990

What are the possible benefits of taking part?
The benefits, in addition to receiving research participation credit, are that you will gain experience of laboratory research that may prove useful when conducting your own research project.

How will your information be used?
Your data will be processed in accordance with the UK-GDPR and the Data Protection Act 2018. All information collected about you (including information about your age and gender) will be kept private and confidential, and you will not be identifiable form the information your provide. The data collected within the study is wholly anonymised and will be kept confidential, safe and secure. You will be assigned a 'participant number' when you agree to take part in the study, which will be used by the researcher to organise the information gained from your responses. Once the study is finished, the data will be kept for a period of 10 years. The reports will be written in a way that no-one can work out that you took part in the study. If the research data is published, it will be in a form such that you cannot be recognised.

If information about you is published it will be in a form such that you cannot be recognized. You will be assigned a 'participant number' when you agree to take part in the study, which will be used by the researcher to organise the information gained from your responses. Your participation in the study is voluntary and you are free to choose whether or not to complete the study. You may stop the procedure for any reason during participation without loss of any benefits of participation.

Data Protection Statement
The data controller for this project will be the University of Hull. The University will process your personal data for the purpose of the research outlined above. The legal basis for processing your personal data for research purposes under GDPR is a 'task in the public interest'.

If you are not happy with the sponsor's response or believe the sponsor processing your data in a way that is not right or lawful, you can complain to the Information Commissioner's Office (ICO) (www.ico.org.uk or 0303 123 1113).

What will happen to the results of the study?
The results of the study will be summarised in a report for the researcher's thesis.

Who has reviewed this study?
Research studies are reviewed by an independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given a favourable opinion by the Faculty of Health Sciences Ethics Committee, University of Hull.

Who should I contact for further information?
If you have any questions or require more information about this study, please contact me using the following contact details:

B.L.MARKHAM-2018@hull.ac.uk

What if I have further questions, or if something goes wrong?

If you wish to make a complaint about the conduct of the study, you can contact the University of Hull using the details below for further advice and information:

In the first instance please contact Beth Markham at B.L.MARKHAM-2018@hull.ac.uk
You can also contact the research supervisor Professor Steve Dewhurst at s.dewhurst@hull.ac.uk

Alternatively please contact registrar@hull.ac.uk

Thank you for reading this information sheet and for considering taking part in this research.

Appendix O: debrief sheet for experiment 2.

UNIVERSITY OF HULL

Debrief Version 1.1 (26/10/2022)

Debriefing Information

Title of study: Imagining hypothetical events.

Researcher: Beth Markham

Thank you for taking part in this study. The participant information sheet provided you with a general overview of the aims of the current study. A more detailed description of the study is provided below. Feel free to take this information away with you and if you have any further questions then contact details for the researchers are provided below.

In the study you just took part in, you were asked to rate a series of words for how relevant they were to two negative and two positive schema-driven scenarios. You were then given a recognition test for some of the words you rated.

The aim of the study is to investigate whether there are gender differences in false memories (erroneous scores) in the recognition test. We were unable to inform you in advance that the study is looking at gender differences in false memories, as well as informing you that you would participate in a recognition test, to ensure you would focus on the rating task rather than trying to memorise the words using another strategy.

Previous research has suggested females reflect on associations in negative word lists more than males, and as a result, females are more likely to create a false memory of a negative lure. Research has also shown thinking about a particular word relating to a hypothetical event increases the likelihood of remembering that event. What we are interested in is whether there is a difference in how males and females rate the words and whether this difference influences the number of words remembered or errors made by each gender.

Your results from this study are completely anonymous. The researchers do not know which responses belong to which person. If the data is published, this will remain completely anonymous.

Contacts for further information:

If you have any questions about the research then please contact Beth Markham:
B.L.MARKHAM-2018@hull.ac.uk

Or you can contact the research supervisor, Professor Steve Dewhurst:
s.dewhurst@hull.ac.uk
01482 465931

Some of the words/scenarios presented to you may trigger some negative thoughts. If this study has raised any issues for you and you would like to discuss them with someone in confidence, then you may find these mental health support services useful:

The Samaritans – Samaritans.org / 116 123
Shout – 85258 (text only)
Hull University Student Assistance Programme (University of Hull students only) – 0800 1380990

Appendix P: full stimuli for rating task for experiment 2.

Rating task

	Negative		**Positive**	
	Hospital	**Exam**	**Picnic**	**Holiday**
Related	Bandages	Answer book	Corkscrew	Beach towel
	Injection	Chair	Hikers	Guidebook
	Stitches	Clock	Plates	Shorts
	Ward	Exam hall	Sunshade	Sunblock
	X-ray	Library card	Tablecloth	Toiletries
	Anaesthetic	Water bottle	Cakes	Air tickets
	Doctor	Calculator	Cutlery	Hotel details
	Medication	Invigilator	Fruit	Sandals
	Pyjamas	Pen	Glasses	Sunglasses
	Visitors	Ruler	Wine	Travel plug
Unrelated	Lawyer	Harp	Glue	Chalk
	Golf clubs	Scooter	Laptop	Hammer
	Scarf	Microwave	Slippers	Piano
	Spear	Sponge	Sword	Candle
	Guitar	Apple	Skis	Screwdriver

Appendix Q: full stimuli for recognition test for experiment 2.

Recognition test

	Negative		**Positive**	
	Hospital	**Exam**	**Picnic**	**Holiday**
Related targets	Bandages	Answer book	Corkscrew	Beach towel
	Injection	Chair	Hikers	Guidebook
	Stitches	Clock	Plates	Shorts
	Ward	Exam hall	Sunshade	Sunblock
	X-ray	Library card	Tablecloth	Toiletries
Related lures	Bed	Desk	Blanket	Currency
	Gown	Exam paper	Drinks	Passport
	Nurses	Pencil case	Hamper	Suitcase
	Painkillers	Seat number	Napkins	Swimwear
	Surgeon	Students	Sandwiches	Tourists
Unrelated targets	Lawyer	Harp	Glue	Chalk
	Golf clubs	Scooter	Laptop	Hammer
Unrelated lures	Lawnmowers	Mirror	Cushion	Iron
	Torch	Paintbrush	Athlete	Guitar