Perceptions of Coach Behaviour, Motivational Climate, and Mental Toughness among Athletes

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Abstract

In this study we tested an *a priori* model that included coach behaviour, motivational climate, and mental toughness among 290 athletes. Structural equation modelling demonstrated that supportive coach behaviours were related to a task-involving climate, and that task-involving climates positively associated with mental toughness. The path between supportive coach behaviours and mental toughness was insignificant. When task-involving climate was taken into account, however, supportive coach behaviours were positively associated with task-involving climates, which in turn was positively associated with mental toughness. This study illustrates the importance of coach behaviour in relation to shaping the motivational climate, which in turn may impact on the development of mental toughness among athletes.

Keywords: Coaching; Ego-involving; Goal Orientation; Mental Toughness; Motivation; Task-involving.

INTRODUCTION

"The ultimate effects that coaching behaviour exerts are mediated by the meaning that players attribute to them" (p. 1527) [1].

As Smoll and Smith [1] alluded, athlete perceptions of coach behaviour are vital in determining how coaches influence their athletes. Indeed, coach behaviour influences athlete development [2], the coach-athlete relationship [3], and anxiety levels [4]. Coach behaviour is also instrumental in shaping the sporting environment, known as the motivational climate [5]. Motivational climates are associated with a variety of desirable (e.g., higher competence, self-esteem, and performance) and undesirable (e.g., negative affect, anti-social moral attitudes, and maladaptive strategies) consequences [6]. Additionally, scholars [7, 8] also linked the motivational climate to the development of mental toughness among athletes. In particular, mastery within the environment fostered the development of mental toughness [7]. To date, however, there are no published studies to quantitatively explore the relationship between these constructs. In this study we tested an *a priori* model that included coach behaviour, motivational climate, and mental toughness.

COACH BEHAVIOUR

Coach behaviour refers to how coaches interact with their athletes [9]. Høigaard et al. [10] reported positive coach behaviours, among a sample of 55 elite Norwegian footballers, aged between 16 and 34 years. These behaviours included receiving positive feedback, training and instruction, and allowing team members to make decisions. Athlete preferences for coach behaviour varied according to the situation, with players preferring more instruction and training behaviour, positive feedback, democratic behaviour, and social support after poorer performances compared to when the team were doing well. Chelladurai [11] found athlete preferences for coach behaviour varied across individuals. Collectively,

these results imply that athlete preferences for coach behaviour vary according to the situation and the individual preferences of the athlete.

Nicolas et al. [12] used Côté's Coach Behavioural Scale for Sport (CBS-S) [9], and categorised coaching behaviours as supportive (e.g., emotional, structural, or instrumental behaviours) or unsupportive (e.g., shouting, manipulation, threatening, or upsetting to athletes). This study contained 80 French individual sport athletes, aged from 15 to 33 years, who competed at various levels and assessed coach behaviours two days before a competition. Supportive coaching behaviours positively predicted goal attainment. Other scholars also adapted this two classification system of coach behaviour. Utilising a sample of 274 athletes of varying ability and aged between 16 and 45 years, Nicholls [3] found supportive coach behaviours were positively associated with the coach-athlete relationship. Jowett [13] developed the 3+1 Cs model of the coach-athlete relationship. This model comprises of closeness (i.e., the extent to which the athlete and coach value, support, and care for each other), commitment (i.e., the intent from both parties to maintain the relationship), complementarity (i.e., the extent to which the behaviors of the coach and athlete correspond to each other), and finally, co-orientation (i.e., whether there are common views between the coach and athlete). Further, Nicholls [3] found that unsupportive coaching behaviours were negatively associated with complementarity, but positively linked to threat appraisals. The effects of coach behaviours do not appear limited to influencing psychological states of athletes either. Keegan and colleagues [5, 14, 15] revealed that the coach behaviours are instrumental in shaping the motivational climate.

MOTIVATIONAL CLIMATE

The motivational climate, according to Nicholls [16], represents the features that are most recognised and valued within a particular setting. Indeed, Nicholls [16] identified two different types of motivational climates, which were referred to as task-involving and ego-

involving climates. In a task-involving climate, athletes believe that the purpose of training is to master skills. In this environment effort and improvement are recognised and rewarded by the coach. Conversely, in an ego-involving climate, there is a strong focus on ability. Athletes are encouraged to compete against each other. Coaches reward athletes who outperform others. Finally, coaches punish mistakes in an ego-involving environment.

Coach behaviour is instrumental in shaping the motivational climate [5, 14, 15]. Keegan [14] explored perceptions of the motivational climate among 28 elite sport performers, who were aged between 15 and 29 years. Giving players the freedom to make choices positively impacted motivation levels. Conversely, a controlling coaching style style negatively caused anger, decreased motivation, and damaged the coach-athlete relationship.

Quantitative scholarly activity [17] highlighted the possible positive effects of task-involving climates within a physical education setting among adolescent athletes with a mean age of 13.9 years. The high-school students exposed to a task-involving climate experienced higher levels of belief in their ability to perform a triple jump and superior technical execution than those within an ego-involving group. There were, however, not differences between those in the task- and ego-involving group in relation to anxiety. Other scholars found contradictory evidence. In particular, Hogue et al [18] reported that individuals assigned to a task-involving group experienced significantly less anxiety compare to those in the ego-involving group. Furthermore, those in the ego-involving group experienced greater cortisol responses, stress, shame, and self-consciousness, than those in the task-involving group. These contradictory findings [17, 18] may be due to data being collected in different settings. This could infer that motivational climate research in physical education settings might not be generalisable to sporting environments. The aforementioned studies did not assess the relationship between motivational climate and mental toughness, but there are empirical [8] and theoretical [19] associations between these constructs.

MENTAL TOUGHNESS

Defining and conceptualising mental toughness is a contentious issue. Gucciardi [20] stated there are many different definitions of this construct. In their most recent definition, Gucciardi [20] incorporated previous attempts and defined mental toughness as "a personal capacity to produce consistently high levels of subjective (e.g., personal goals or strivings) or objective performance (e.g., sales, race time, GPA) despite everyday challenges and stressors as well as significant adversities" (p. 28).

In addition the numerous definitions of mental toughness [20], there are also many conceptual models [21-23]. Clough [21] suggested that mental toughness is an extension of hardiness and includes 4Cs: control (i.e., feeling and acting as if one is influential), commitment (involving oneself in a group rather than be isolated from the group), challenge (believing that events are changeable and challenging, rather than threatening), and confidence (i.e., believing in one's ability to achieve success). Gucciardi and colleagues [22] developed their model based on research with Australian Rules football coaches. This model included behaviours and characteristics associated with mental toughness, along with situations in which athletes demonstrate their mental toughness. The characteristics of mental toughness included constructs such as resilience, self-belief, and emotional intelligence. Behaviours focused on the actions of mentally tough athletes in normal life and in competition. Finally, situations included players being able to manage internal and external pressures. More recently, Hardy et al. [23] provided a new conceptualisation of mental toughness, which is grounded in revised Reinforcement Sensitivity Theory [24], and viewed this construct as a behaviour. That is, Hardy [23] suggested that athletes demonstrate mental toughness by achieving personal goals, despite experiencing pressure from a range of stressors. Although there are different conceptualisations of mental toughness, some commonalities exist across all conceptual models. In particular, the ability to maintain high

standards of performance under pressurised circumstances appears to be a common attribute of this construct.

The literature indicates relationships between mental toughness and the motivational climate [7, 8], and coach behaviours [22, 25]. With a sample of seven elite athletes, whose mean age was 33 years, Connaughton et al. [7] revealed that task-involving motivational climates facilitated the development of mental toughness. With a sample of adolescent cross-country runners, who had a mean age of 14.39 years, Mahoney [8] found a positive association between autonomy-supportive environments and mental toughness via psychological needs satisfaction. Conversely, controlling environments and mental toughness were negatively and indirectly related to each other through psychological needs satisfaction. As such, it is still unclear whether there is a direct association between the motivational climate and mental toughness.

In support of Cushion's [2] assertion regarding the role of coaches in developing athletes, Gucciardi et al. [22] reported that coach behaviour facilitated the development mental toughness, in an interview study with 11 Australian Rules Football coaches. In a follow up study, Gucciardi et al. [25] re-interviewed the same coaches [22], but provided more information on how coaches influenced mental toughness. They reported that the coach-athlete relationship, coach's philosophy, the training environment, and the strategies employed by the coach (e.g., developing game awareness) facilitated the development of mental toughness. Further, negative coach behaviours, such as the coach putting success before player development impedes mental toughness development. It should be noted that the research by Gucciardi and colleagues [22, 25] was qualitative, and included coaches who worked in Australian Rules football. As such, the findings of this study cannot be generalised to athletes who participate in other sport. It is also unclear how accurate these findings are, because the accuracy of these coach opinions remains untested among athletic samples.

Quantitative research, which contains athletes who participate in different sports, is warranted verify the generalisability of Gucciardi's findings [22, 25].

SUMMARY AND HYPOTHESES

In summary, coach behaviour is related to motivational climate [5, 14, 15] and mental toughness [22, 25]. In addition, the motivational climate may facilitate the development of mental toughness [7, 8]. The relationship between these constructs, however, has not been quantitatively explored within a single model. We examined an *a priori* model that included perceptions of coach behaviour, motivational climate, and mental toughness. The hypothesised paths are depicted in Figure 1, with an unbroken line inferring a positive relationship and a broken line representing a negative path. We hypothesised a positive path between supportive coaching behaviours and task-involving climate, but a negative path from supportive coaching behaviours to task-involving climates. We also predicted that there would be a negative path from unsupportive coaching behaviours to task-involving climate, but a positive path to ego-involving climate, based on the findings of previous research [5, 14, 15]. It was hypothesised that there would be a positive path from supportive behaviours to mental toughness and a negative path from unsupportive coaching behaviours [22, 25]. Finally, we predicted a positive path from task-involving climates to mental toughness, but a negative path from ego-involving climate to mental toughness, based on previous scholarly activity [7, 8].

METHOD

PARTICIPANTS

In order to be considered to take part in this study, participants were required to be involved in competitive sport. As such, individuals who participated in any type of competitive sport met the inclusion criteria for this study. Two-hundred and ninety athletes (227 men), who were aged between 12 and 27 years (mean ± SD; age 18.6 ± 4.6 yr)

participated in this study. The sample comprised of white (*n* = 275), Afro-Caribbean (*n* = 8), Asian (*n* = 6), and mixed race (*n* = 1) athletes. These athletes participated at international/national (*n* = 10), county (*n* = 96), or club (*n* = 184) levels.

QUESTIONNAIRES

The 47-item Coach Behaviour Scale for Sport (CBS-S) [9] assessed the athletes' perceptions of seven coach behaviours. In accordance with previous research [3, 11], 39 questions were classified as supportive coaching behaviours, whereas eight questions assessed unsupportive coach behaviours. Participants responded to the stem "How frequently do you experience the following coach behaviours?" An example of a supportive coaching behaviour question was "The coach(es) most responsible for my technical skills gives me specific feedback for correcting technical errors in my sport." The question "my head coach intimidates me physically" was an example of an unsupportive coaching behaviour. All questions were answered on a 7-point Likert-type scale, which ranged from 1 = *Never* to 7 = *Always.* With a sample of 205 athletes, Côté et al. [9] reported Cronbach alpha coefficients of between 0.85 and 0.96 for the CBS-S.

The Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2) [26] assessed motivational climate. Participants responded to the stem, "Please think about how it has felt to play on your sport team throughout this season." This 33-item questionnaire measured task-involving (e.g., "players feel successful when they improve) and ego-involving (e.g., "players are encouraged to outplay the other players") motivational climates. Questions were answered on a 5-point Likert-type scale, anchored at 1 = *Strongly Disagree* and 5 = *Strongly Agree.* Newton et al. [26] reported Cronbach alpha coefficients of 0.88 for the task-involving subscale and 0.87 for the ego-involving subscales of the PMCSQ-2.

The Mental Toughness Questionnaire-18 (MTQ-18); Clough et al. [21] assessed the athletes' mental toughness. This questionnaire contains 18 items and measures mental

toughness as a unidimensional construct. Recent scholarly activity advocated the unidimensional measurement of mental toughness [20]. Participants responded to the stem "Please answer these items carefully, thinking about how you are generally." Examples of a question from this questionnaire included "I generally cope well with any problems that occur" and "However bad things are, I usually feel they will work out positively in the end." All questions were answered on a 5-point Likert-type scale, anchored at 1 = *Strongly Disagree* and 5 = *Strongly Agree.* Although there is limited assessment of the validity of the MTQ-18, Clough et al. [21] found that it correlated very strongly (r = .87) with the Mental Toughness Questionnaire-48 [21]. Perry et al. [27] reported that the MTQ-48 had acceptable factorial validity among a sample of 8207 participants.

PROCEDURE

Ethical approval was obtained from a departmental ethics committee and then an information letter was sent to athletes. Consent forms were provided to athletes who were 16 years of age and over, who provided written consent before participating in the study. Assent forms were distributed to participants who were under 16 years of age, along with consent forms for parents or guardians. As such, participants under the age of 16 co-signed along with parent or guardian before taking part in this study. Each participant completed the CBS-S [9] the PMCSQ-2 [26], and then the MTQ18 [21] in the presence of a trained research assistant who was able to answer any questions and clarify the meaning of any questions, if required.

DATA ANALYSIS

Data were screened for outliers and normality and internal consistency was assessed using omega point estimates and bootstrapped confidence intervals [28]. Factorial validity of each measurement scale was assessed using confirmatory factor analyses. Bivariate correlations were used to explore relationships between variables. To test the hypothesised *a priori* model, we used structural equation modelling (SEM) with the MLR estimator to guard

against departure from multivariate normality, interpreting model fit by avoiding golden rules[29, 30]. In particular, fit index cutoff values were not used to interpret confirmatory factor analyses due to the restricted sample size. Rather, we examined standardised parameter estimates. Factor loadings for CFA were interpreted using Comrey and Lee's [31] recommendations (i.e., >.71 = excellent, >.63 = very good, >.55 = good, >.45 = fair and >.32 = poor). To assess mediation, we ran 5,000 bootstrapped samples, which provided standard errors for confidence intervals [32]

RESULTS

Preliminary analysis found no missing data, outliers, or issues with univariate normality (skewness < 2, kurtosis < 2). Omega point estimates and confidence intervals using the MBESS package [33] in R [34] with 1,000 bootstrap samples suggested no issues regarding internal consistency of any variables (supportive coach behaviour = .91 (95% CI = .89, .93), unsupportive behaviour = .90 (95% CI = .91, .94), task-involving climate = .92 (95% CI = .91, .94), ego-involving climate = .93 (95% CI = .90, .94), mental toughness = .80 (95% CI = .73, .84). All subsequent analysis was conducted using Mplus 7 [35].

To examine the factorial validity of the measures in the sample, a confirmatory factor analysis was carried out on each measure. The CBS-S presented a model fit of: $\chi^2(1013) = 2780.67$, $p < .001$, CFI = .826, TLI = .814, SRMR = .076, RMSEA = .078 (90% CI = .074, .081). All items loaded significantly onto their factor. In total, 41 of the loadings were excellent, four were very good, one was good, and one item fair. The PMCSQ-2 yielded a model fit of: $\chi^2(480) = 1162.61$, $p < .001$, CFI = .834, TLI = .818, SRMR = .060, RMSEA = .070 (90% CI = .065, .075). All items loaded onto their factor, 14 of which were excellent. Eleven items presented a very good loading, five were good, and three were fair. The MTQ-18 presented a model fit of: $\chi^2(101) = 191.79$, $p < .001$, CFI = .907, TLI = .859, SRMR = .076, RMSEA = .056 (90% CI = .044, .068). Generally, standardised parameter estimates

were low however, with only three items registering as very good, two as good, three as fair, and five as poor. A further five items loaded below .30.

Bivariate correlations presented a positive relationship between mental toughness and a task-involved climate (r = .40, 95% CI = .28, .50, p < .001) and a negative relationship between mental toughness and an ego-involved climate (r = -.30, 95% CI = -.41, -.18, p < .001). Supportive coach behaviours were positively associated with a task-involved climate (r = .52, 95% CI = .43, .61, p < .001) and mental toughness (r = .17, 95% CI = .04, .29, p < .01), but negatively associated with an ego-involved climate (r = -.22, 95% CI = -.33, -.10, p < .001). Unsupportive coach behaviours were positively associated with an ego-involved climate (r = .49, 95% CI = .39, .58, p < .001) and task-involved and ego-involved climates were negatively correlated (r = -.49, 95% CI = -.60, -.37, p < .001).

To test the hypothesised *a priori* model, SEM was conducted in two stages. Firstly, the measurement model was examined and then structural paths added. Regarding sample size, Bentler and Chou [36] recommended at least five cases per estimated parameter to satisfactorily test a SEM. To enable this, we used a parcelling technique by collapsing items from a scale into multiple composites. In a review on this subject, Sterba and MacCullum [37] identified that parcelling is appropriate when testing relationships between constructs and item-level factor structure has been verified, as per the present study. To build parcels, we ran maximum likelihood exploratory factor analyses for each variable in the model, extracting factors with an eigenvalue greater than one. This resulted in three parcels for mental toughness, three for ego-involved climate, two for task-involved climate, and five for supportive coach behaviours. Only one factor could be extracted for the unidimensional unsupportive coach behaviours. Thus, this variable was included as an observed variable. The parcelling procedure resulted in a ratio of cases per free parameter of 6.04:1.

The measurement model demonstrated good model fit: $\chi^2(59) = 140.28$, $p < .001$, CFI = .973, TLI = .964, SRMR = .035, RMSEA = .069 (90% CI = .054, .084). Next, structural paths were added to the model, which yielded a similar model fit: $\chi^2(69) = 172.47$, $p < .001$, CFI = .963, TLI = .951, SRMR = .038, RMSEA = .072 (90% CI = .059, .085). Path estimates are presented in Figure 2. Of note, supportive coach behaviours presented a significant positive path to task-involved climate (β = .52, 95% CI = .39, .66, $p < .001$), which presented a positive path to mental toughness (β = .41, 95% CI = .17, .64, $p < .001$). Bootstrapped confidence intervals revealed a significant indirect effect from supportive coach behaviours to mental toughness. Specifically, this relationship was mediated by a task-involved climate (γ = .21, 95% CI =.08, .35, p = .001). This is a particularly noteworthy result, as the direct relationship between supportive coach behaviour and mental toughness was not significant (β = -.06, 95% CI = -.25, .13, p = .43).

As our sample contained athletes with a broad range of ages, we examined the measurement and structural model invariance amongst those aged under 18 (n = 84) and those 18 and over (n = 206) through multigroup SEM. Invariance was supported if ΔCFI was less than .01 on increasingly constrained models [38]. Model invariance indicates the measurement and structural paths are replicated without significant change across different groups. Firstly, measurement invariance was established by presenting an acceptable model fit at baseline: $\chi^2(118) = 253.80$, $p < .001$, CFI = .959, TLI = .945, SRMR = .047, RMSEA = .089 (90% CI = .074, .104). The measurement model was then further examined, sequentially constraining the factor loadings across subsamples (metric invariance), item intercepts (scalar invariance), and factor means (residual invariance). Next, we examined the structural model across groups by adding structural paths to the measurement model and repeating the process for configural invariance, metric invariance, and scalar invariance. At this point, the structural paths were constrained to be equal across groups to examine strict

structural invariance, which presented an acceptable model fit: $\chi^2(165) = 337.34$, $p < .001$, CFI = .950, TLI = .945, SRMR = .097, RMSEA = .085 (90% CI = .072, .098). The results of the invariance testing are presented in Table 1, and demonstrate no age effect on the model.

We then examined if these relationships differed between those scoring high and low on mental toughness. For this, the sample was split into thirds by mental toughness score. The middle third was discarded to create a low mental toughness group (n = 86) and a high mental toughness group (n = 102). Fisher's r to z transformation to examine group differences. Significant group differences were evident for several relationships (see Table 2). In all significant z scores, the high mental toughness group presented a stronger relationship between variables than the low mental toughness group. Most notably, there was a greater negative relationship between supportive and unsupportive behaviours, and task- and ego-involved climates in the high mental toughness group. While there was no relationship between unsupportive behaviours and mental toughness for the low mental toughness group, there was a positive relationship observed for the high mental toughness group.

DISCUSSION

In this study we assessed an *a priori* model that included perceptions of coach behaviour, the motivational climate, and mental toughness. Several of our hypothesised paths were significant. There was a positive path between supportive coach behaviours and a task-involving climate, along with a positive path between task-involving climate and mental toughness. Contrary to our hypotheses, the paths between unsupportive coaching behaviours and ego-involving climates, and ego-involving climates with mental toughness were not significant. The age of the athletes did not affect these results.

Although there was a positive correlation between supportive coaching behaviours and mental toughness, which supports Gucciardi's research [22, 25], the path was not significant. This could imply that Gucciardi's studies [22, 25] may only be relevant among

Australian Rules football clubs, or that the coaches overestimated their role in the development of mental toughness. It should be noted, however, that when task-involving climate was taken into account, supportive coaching behaviours positively influenced task-involving climate, which in turn positively influenced mental toughness. This provides quantitative support for previous qualitative findings by Keegan and colleagues [5, 14, 15] that coaches shape the climate and provides additional evidence to document the importance of coach behaviour in shaping the motivational climate. This finding also illustrates that the way coaches behave and the climate they can create, may directly influence athlete well-being or ill-being. Research by Hogue [18] found that individuals in a task-involved climate experienced less anxiety than those in the ego-involved climate, who in turn experienced more stress, shame, self-conscious, and greater cortisol responses than those in the task-involved group. It is imperative that coaches adopt positive coach behaviours in order to foster a task-involving climate.

Our findings also provide support for other research linking motivational climate with the development mental toughness [7, 8]. In light of previous findings and those generated in this research, it appears that task-involving climates facilitate the development of mental toughness among athletes. Although this study was not longitudinal, Connaughton [7] suggested that the exposure to task-involving climates over a pro-longed period fostered the development of mental toughness. Researchers could monitor the motivational climate and mental toughness levels over a pro-longed period to test Connaughton's [7] findings quantitatively. Even though task-involved climates were positively associated with mental toughness, contrary to our hypotheses, ego-involved climate were not negatively associated with mental toughness. This would suggest that although the motivational climate is important for facilitating mental toughness, it may be less influential in hampering or

reducing mental toughness levels. Further research is required to assess the impact of ego-involving climates on mental toughness.

In relation to the aforementioned relationship between ego-involving climates and mental toughness, our hypothesised relationship between unsupportive coaching behaviours and ego-involving climates were not supported either. This finding could indicate that negative coach behaviours affect the motivational climate and mental toughness less than supportive coach behaviours. Indeed, negative coaching behaviours had a weaker association with the coach-athlete relationship than positive coaching behaviours in a previous study [39]. Alternatively, the questionnaire we used to assess coach behaviour might not capture all unsupportive coaching behaviours, as the CBS-S [9] only contained eight items that assessed unsupportive coaching behaviours. It should also be noted that the CBS-S [9] does not include unsupportive coach behaviours such as accepting excuses from players, emphasising player weakness, and not fostering the correct environment, which negatively influence mental toughness [25]. The CBS-S could be refined to include more items that assess negative coach behaviours, so that the scale provides are more balanced assessment of coach behaviours. This may yield more accurate data. Despite our finding, the effects of unsupportive coaching behaviours should not dismissed, because these behaviours are related to enhanced aggression [40]. Our findings might be due to the questionnaire we employed not fully assessing this construct, and should be interpreted with caution.

Although not one of our hypotheses, our data suggests that the mentally tough athletes are more aware of unsupportive coaching behaviours, compared to less mentally tough athletes. Mentally tough athletes may view criticism constructively to help them improve their performance. Indeed, Gucciardi et al. [41] assessed the effects of a psychological skills and mental toughness training programme among under-15 soccer players. Players in the mental toughness training group changed how they viewed coach criticism. In particular, these

players became more receptive to coach criticism and interpreted it as fostering improvement rather than a personal attack. Future research could explore this finding in more depth by assessing perceptions of coach behaviour among people with different levels of mental toughness. An alternative explanation for this finding is that coaches behave more unsupportively to athletes who are more mentally tough, in comparison with those who are less mentally tough. This could be because coaches believe these are athletes are able to handle more abrasive behaviours. Studies that observe coach behaviour in relation to differential mental toughness levels are warranted.

LIMITATIONS

A limitation of this study is that we did not measure the amount of time the athletes dedicated to their sport each week. There was a small, but positive correlation between weekly training time and mental toughness [8] among adolescent cross-country runners. Unfortunately, this finding emerged after we collected our data. Additionally, our sample contained many more male than female athletes. It is plausible that the relationships between mental toughness and coach behaviour or motivational may be affected by the gender of the athletes. Researchers from workplace psychology found gender differences in leadership behaviour preferences [42]. As such; our findings may be influenced by the lack of females in our sample.

RECOMMENDATIONS

In light of the present findings, coaches could shape the motivational climate, and in particular create a task-oriented climate by engaging in positive coaching behaviours such as technical advice, mental preparation for athletes, and developing a personal rapport. Our findings also indicate that supportive coaching behaviours alone will not help facilitate the development of mental toughness among athletes. However, if coaches develop more positive coaching behaviours and create a task-involving mastery climate, then mental toughness

levels may increase. The literature indicates that coach behaviour [43] and the motivational climate [18] can be manipulated. Both coach behaviour and the motivational climate have not been manipulated within the same study. Our findings suggest that a combined intervention could enhance mental toughness among athletes.

CONCLUSIONS

We found some support for our *a priori* model that included coaching behaviours, motivational climate, and mental toughness among athletes. Although the path between supportive coaching behaviours and mental toughness was not significant, when task-involving climate was taking into account, supportive coaching behaviours positively influenced task-involving climate, which in turn positively influenced mental toughness. This study illustrates the importance of coach behaviour on influencing the climate, which in turn may affect mental toughness levels.

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Table 1

Measurement and structural model invariance between age groups for under 18 (n = 84) and 18 and over (n = 206)

Model	χ^2	*df*	$\Delta\chi^2$	Δdf	CFI	TLI	SRMR	RMSEA (90% CI)
Measurement Model								
Configural invariance	253.80*	118	-	-	.959	.945	.047	.089 (.074, .104)
Metric invariance	266.45*	127	12.65	9	.958	.948	.058	.087 (.072, .102)
Scalar invariance	287.15*	136	20.70	9	.954	.947	.061	.088 (.073, .102)
Residual invariance	331.40*	140	44.25	4	.942	.935	.167	.097 (.084, .111)
Structural Model								
Configural invariance	279.88*	138	-	-	.959	.945	.059	.084 (.070, .098)
Metric invariance	293.12*	147	13.24	9	.957	.947	.068	.083 (.069, .097)
Scalar invariance	313.83*	156	20.71	9	.954	.946	.070	.084 (.070, .097)
Structural Invariance	337.34*	165	23.51	9	.950	.945	.097	.085 (.072, .098)

Note. *df* = degrees of freedom, CFI = comparative fit index, TLI = Tucker-Lewis index, SRMR = Standardized root mean square residual, RMSEA = Root mean square error of approximation. *p < .001.

Table 2

Comparison between high and low mental toughness groups on observed relationships

Relationship	High MT	Low MT	*z*
Supportive – Unsupportive behaviours	-.25*	.12	-2.53*
Supportive behaviours – Task climate	.58**	.47**	1.02
Supportive behaviours – Ego climate	-.30**	.11	-2.71**
Supportive behaviours – Mental toughness	.12	.10	.14
Unsupportive behaviours – Task climate	-.22*	.13	-2.38*
Unsupportive behaviours – Ego climate	.56**	.52**	.38
Unsupportive behaviours – Mental toughness	.21*	-.03	1.63
Task-involving climate – Ego-involving climate	-.42**	-.21*	-1.58
Task-involving climate – Mental toughness	.11	.17**	-.41
Ego-involving climate – Mental toughness	-.01	-.03	.13

Note. Value provided in High MT and Low MT column is correlation coefficient (*r*). *z* = Fisher's *z* test of no difference between *r* values following *r* to *z* transformation.

*Statistically significant at $p < .05$; **$p < .01$.

Figure 1. Hypothesised Paths

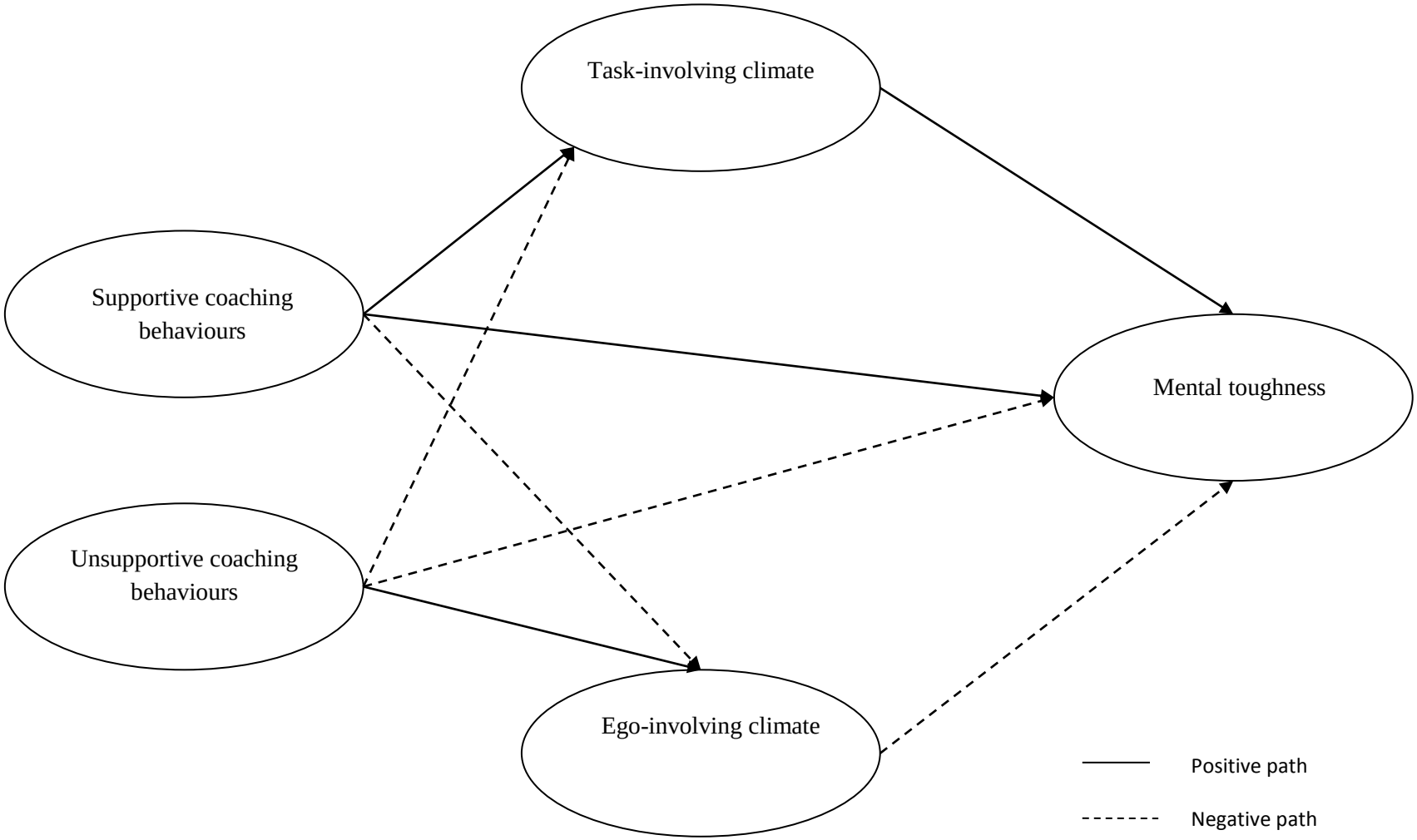

Figure 2. Structural equation model with path estimates