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To cite this article: Ross M. Murray, James H. Dugdale, Christine M. Habeeb & Calum A. Arthur (2021) Transformational parenting and coaching on mental toughness and physical performance in adolescent soccer players: The moderating effect of athlete age, European Journal of Sport Science, 21:4, 580-589, DOI: [10.1080/17461391.2020.1765027](https://doi.org/10.1080/17461391.2020.1765027)

To link to this article: <https://doi.org/10.1080/17461391.2020.1765027>



Published online: 25 May 2020.



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ORIGINAL ARTICLE

## Transformational parenting and coaching on mental toughness and physical performance in adolescent soccer players: The moderating effect of athlete age

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### Abstract

Both parent and coach leadership behaviours are instrumental to adolescent athlete development. Researchers, however, are yet to examine parent and coach leadership influences simultaneously, and at different stages of adolescents' psychological and physical development. Therefore, the purpose of this study was to understand if the effects of transformational parenting, and transformational coaching on mental toughness and performance varied at different ages during adolescence. Early adolescent (ages 10–14) and late adolescent (ages 15–18) soccer players ( $n = 334$ ) completed questionnaires assessing their perceptions of their mother's, father's, and coach's transformational leadership, as well as a questionnaire assessing mental toughness. Participants also completed a comprehensive battery of physical fitness tests relevant to soccer. Results indicated that transformational fathering was more strongly associated with levels of mental toughness for early adolescent athletes than it was for later adolescent athletes. Results also indicated that transformational coaching was more strongly associated with physical performance for later adolescent athletes than it was for early adolescents. Overall, these results can inform development models and provide support for future longitudinal studies to assess the impact of parent and coach transformational leadership across different stages of athlete development.

**Keywords:** *Leadership, youth, mother, father, development*

### Highlights

- Previous research has linked transformational leadership behaviours of parents and coaches with mental toughness and performance outcomes of adolescents. We examined whether these relationships varied as a function of age, expecting stronger associations between younger athletes and their parents as well as older athletes and their coaches.
- We analysed 314 adolescent soccer players between the ages of 10 to 17. Questionnaires were used to assess perceptions of their parents' and coaches' transformational leadership behaviours. Participants also completed a measure of mental toughness, and seven field-based fitness tests as a measure of physical performance.
- Multilevel models were used to examine the interaction between athlete age and transformational leadership of parents and coaches on athlete mental toughness and physical performance. Fathers' transformational leadership was positively associated with younger athletes' mental toughness. Coaches' transformational leadership was positively associated older athletes' physical performance.
- Overall, the results indicate the influence of parents' transformational leadership might be stronger on younger adolescent athletes; while coaches' transformational leadership might be stronger on older adolescent athletes. Further research is needed to confirm these findings and understand causal pathways.

Adolescence is an important time in the development of an athlete. During this period, many young athletes are competing for professional contracts that will dictate their future participation in sport and overall

life course. While there are many factors that contribute to the success of athletes' careers, their psychological and physical development are of high importance. Compared to non-athletes and

recreational athletes, athletes performing at a high level have been observed to be more mentally tough (Vaughan, Donncha, & Breslin, 2018) and record higher scores on physical performance tests (Dugdale, Arthur, Sanders, & Hunter, 2019). As such, understanding how athletes develop mental toughness and their physical performance can significantly contribute to strategies aimed at improving adolescent athlete development. To date, researchers have identified athletes' support networks, specifically parents and coaches, as an essential component of athletes' psychological and physical development (Rees & Hardy, 2000). Specifically, leadership behaviours from both parents and coaches, such as setting a positive example and inspiring motivation (i.e. transformational leadership behaviours), have been associated with both mental toughness and performance outcomes (Bell, Hardy, & Beattie, 2013; Charbonneau, Barling, & Kelloway, 2001). Further, the impact of parents and coaches might differ as athletes' progress from early adolescence (around ages 10–14) into and through late adolescence (around ages 15–18). As athletes get older, for example, they may be less influenced by their parents, while at the same time more influenced by their coaches (Côté, 1999). Therefore, the purpose of this study was to understand if the effects of transformational parenting and transformational coaching on mental toughness and physical performance varies as a function of age.

Bass (1995) defined a transformational leader as "someone who raised [followers'] awareness about issues of consequence, shifted them to higher-level needs, influenced them to transcend their own self-interests for the good of the group or organisation, and to work harder than they originally had expected they would" (p.167). Transformational leadership is an important predictor of psychological and behavioural outcomes within many different contexts including sport (Bormann, Schulte-coerne, Diebig, & Rowold, 2016), military (Bass, Avolio, Jung, & Berson, 2003), school (Verma, Eklund, Arthur, Howle, & Gibson, 2019), and family (Morton et al., 2011). Within sport specifically, transformational leadership behaviours have been associated with higher levels of mental toughness and performance (Bell et al., 2013).

Transformational leadership can be manifested within parents (i.e. transformational parenting; Morton et al., 2011) and is likely associated with both mental toughness and physical performance. Mental toughness, "a personal capacity to produce consistently high levels of performance despite everyday challenges and stressors as well as significant adversities" (Gucciardi, Hanton, Gordon,

Mallett, & Temby, 2015, p. 5), is believed to be fostered through parental supportiveness and parental belief in their child's sporting capabilities (Connaughton et al., 2008). Although there is a dearth of research quantitatively examining parental influences that foster mental toughness in adolescents, Morton and colleagues' conceptualisation of transformational parenting aligns with the qualities needed to improve mental toughness. For example, Morton and colleagues suggest that transformational parenting involves communicating high expectations and optimism regarding what their children can achieve (i.e. inspirational motivation). As such, transformational parenting is likely associated with higher levels of mental toughness in adolescent athletes. Further, the support and belief that is consistent with transformational parenting might also facilitate athletes' physical performances. For example, researchers have found that athletes typically perform better when fellow teammates demonstrate a strong belief in their abilities (Habeeb, Eklund, & Coffee, 2017). This research suggests that individuals' performance is significantly better when they perceive those around them believe in their abilities. Extending this beyond teammates, athletes who perceive that their parents believe in them (i.e. transformational parenting) likely demonstrate a stronger physical performance compared to athletes whose parents do not demonstrate a belief in them.

Alongside parents, transformational leadership behaviours displayed by coaches (i.e. transformational coaching; Arthur, Woodman, Ong, Hardy, & Ntoumanis, 2011) can also have an impact on athletes' mental toughness and performance. Sport coaches are often seen as leaders to adolescents (Burgess & Naughton, 2010) and in this context, transformational coaching can positively impact athlete developmental outcomes such as athlete motivation (e.g. Arthur et al., 2011). Indeed, coaches' abilities to motivate athletes through transformational coaching may be responsible for the positive impact transformational coaching has on both mental toughness and physical performance in adolescent followers (Bell et al., 2013). An intervention study on adolescent cricketers found that athletes report higher levels of mental toughness and perform better when their coaching staff demonstrate transformational coaching behaviours. As such, athletes exposed to transformational coaching are likely to report higher mental toughness and stronger physical performance.

Importantly, these effects of transformational parenting and coaching on mental toughness and performance likely evolve as athletes progress through

adolescence. According to the Long Term Athlete Development model, adolescents progress through different stages within their psychological and physical development as an athlete (Balyi & Hamilton, 2004; Ford et al., 2011). Within this model, children's early sporting experiences should be focused on fun and participation. It is not until athletes reach early adolescence (around ages 10–14) that they should participate in focused training (i.e. training to train) and then progress into training for competition (i.e. training to compete) during mid-to-late adolescence (around ages 14–18). Further, regarding skill development, researchers have noted important differences in how youth engage in sport as they progress through adolescence. For example, researchers noted the importance of deliberate play (e.g. street hockey with friends) during childhood and early adolescence (Ford, Ward, Hodges, & Williams, 2009), while deliberate practice (e.g. a team practice run by a coach) becomes more important into middle-to-late adolescence (Côté, Ericsson, & Law, 2007).

The changes in engagement in sport as young athletes grow older might have an important role in determining the strength and direction of psychological and behavioural relationships pertinent to athlete development. There is evidence that parents are more influential during childhood and early adolescence which coincides with the training to train and deliberate play stages of athlete development (Côté, 1999; Holt, 2016). Coaches, however, are believed to be more influential at middle-to-late adolescence and into young adulthood, which is closer to the training to compete and deliberate practice stages of athlete development (Côté, 1999; Holt, 2016). These propositions, however, have not been tested in a leadership model in early adolescent and adolescent athletes.

Building on previous research, the current study was designed to test whether the effects of transformational parenting and coaching on athlete mental toughness and physical performance varied at different ages during adolescence. It was hypothesised that:

- (1) There would be a stronger positive relationship between transformational mothering/fathering and (a) mental toughness and (b) physical performance among athletes in early adolescence (i.e. ages 10–14) compared to athletes in later adolescence (i.e. ages 15–18).
- (2) There would be a stronger positive relationship between transformational coaching and (a) mental toughness and (b) physical performance in athletes in later adolescence, compared to a weaker relationship in early adolescence.

## Method

### Participants

A total of 334 male Scottish soccer players from 49 teams participated in this study. Participants' age ranged from 10.0 years to 17.3 years ( $M = 13.6$ ,  $SD = 1.7$ ). Participants were recruited from 24 competitive adolescent soccer clubs from the 'Club Academy Scotland' infrastructure within the Scottish Football Association, across three levels; amateur ( $n = 115$ ), development ( $n = 97$ ), and performance ( $n = 122$ ). Data from 20 participants were removed from the final analysis because they participated in a team with less than three athletes participating in the study ( $n = 15$ ), they were a single parent child or reported information for only one parent ( $n = 4$ ), or failed to complete any of the performance measures ( $n = 1$ ). The final sample consisted of 314 athletes from 36 teams (11 amateur, 11 development, and 14 performance).

### Measures

**Demographics and anthropometrics.** Height was assessed using a free-standing stadiometer (Seca, Birmingham, UK) and reported to the nearest 0.1 cm, while weight was assessed using digital floor scales (Seca, Birmingham, UK) and reported to the nearest 0.1 kg. Participants also reported their date of birth and current playing club.

**Transformational parenting.** Transformational mothering and transformational fathering was assessed using the Transformational Parenting Questionnaire (TPQ; Morton et al., 2011). The scale consists of 16-items assessing four dimensions: idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration. All subscales were combined to achieve a composite measure of transformational mothering and transformational fathering. Participants answered items separately for each of their parental figures (i.e. whomever a participant deemed to fulfil the primary mother role and father role; not required to be a biological parent). Participants responded to all items on a six-point scale ranging from *strongly disagree* (0) to *strongly agree* (5). The internal consistency ( $\alpha$ ) of responses to the items was .84 for transformational mothering and .90 for transformational fathering within this sample of participants.

**Transformational coaching.** Transformational coaching was assessed using a modified version of the Differentiated Transformational Leadership Inventory (DTLI; Hardy et al., 2010). The scale consists of 27 items to assess seven dimensions: individual consideration, inspirational motivation, intellectual stimulation, high-performance expectations, fostering

acceptance of group goals, contingent reward, and appropriate role modelling.<sup>1</sup> All subscales were combined to create a composite measure of transformational coaching. Participants were instructed to answer items relative to their head coach and responded to all items on a five-point scale ranging from *not at all* (1) to *all the time* (5). The internal consistency ( $\alpha$ ) of responses to the items for transformational coaching was .89 within this sample of participants.

**Mental toughness.** Mental toughness was measured using the Mental Toughness Index (MTI; Gucciardi et al., 2015). This measure has been used across performance contexts and with youth samples (Mahoney, Ntoumanis, Gucciardi, Mallett, & Stebbings, 2016). The MTI consists of eight items that measure the extent to which athletes agree with statements pertaining to their perceptions of mental toughness (e.g. “I believe in my ability to achieve my goals”). Items were rated on a scale of *100% false* (1) to *100% true* (7). The internal consistency ( $\alpha$ ) of responses to the items was .82 in this sample of participants.

**Physical performance.** Performance was measured using seven field-based fitness tests commonly used as physical performance measures within adolescent soccer (Paul & Nassis, 2015); grip dynamometry, standing broad jump, counter-movement vertical jump, 505 change of direction, T-drill, 10 m sprint, and 20 m sprint. All selected tests were identified to be appropriate for implementation across the entire age range of the selected sample, and relevant to the demands of adolescent soccer (Paul & Nassis, 2015). Tests of physical performance were conducted at two-time points around one week apart. Validity and reliability of these measures have been demonstrated in previous research (Dugdale et al., 2019). The physical performance data for the 314 individuals in our analytic sample were also included in the 373 individuals analysed in Dugdale et al. (2019).

### Procedures

The study received approval from an ethics committee at a university in the United Kingdom. Prior to data collection, and in compliance with the recommendations of the Declaration of Helsinki, participant and parental/guardian consent was gained alongside providing comprehensive written and oral explanations about the study. Upon obtained consent/assent, participants' demographic and anthropometric measures were collected. Participants then completed the transformational leadership questionnaires (i.e. mother, father, and coach) and mental toughness

questionnaire without the presence of coaches or parents. Following completion of questionnaires, participants completed the seven physical performance tests. Follow up physical performance testing was completed within two weeks of the first testing session. Physical performance testing lasted approximately one hour in length for both testing sessions.

### Data analysis

Descriptive statistics, reliability coefficients, bivariate correlations, and intraclass correlation coefficients (ICC) of the outcome variables were calculated. ICC values were .19 for mental toughness and .24 for performance, indicating a meaningful amount of variance was present at the team level. Multilevel models were conducted to account for the interdependencies in the dataset (i.e. players nested within teams). However, the analytic focus remained on the individual level and therefore random intercepts and fixed slope models were used. The R package nlme (Bates, Machler, Bolker, & Walker, 2015) was used to compute separate multilevel models for mental toughness and performance. All transformational leadership variables were group mean centred while control (i.e. athlete height, weight, and club level) and moderating variables (i.e. age) were standardised. Test of homogeneity, linearity, and normality adhered to assumptions of residual normality. Little's (1988) MCAR statistic was not significant  $\chi^2(585) = 576.02$ ,  $p = .353$ , indicating that missing values were missing completely at random. The proportion of missing data was < 1% for all variables. All missing data were replaced using the individual's mean score for the subscale in which the item was missing. When participants missed one of the testing sessions (< 1.3%) their scores from the session in which they did attend were used as their physical performance scores.

To calculate an overall physical performance score, participants' scores on physical performance tests (e.g. agility, sprint, etc.) over two-time points were averaged together and then standardised. Timed scores were then multiplied by -1 so that positive scores indicated a better performance for all tests. Participants' standardised scores across all performance tests were averaged together to obtain a global performance score. Finally, in line with the performance assessment criteria of the Scottish Football Association, we calculated athletes' relative performance scores by birth year so that performance scores represented athletes' physical abilities relative to athletes born in the same year. To achieve this end, the mean global performance score from each birth year

Table I. Descriptive statistics and bivariate correlations for study variables.

	Descriptive Statistics		Bivariate correlations							
	M	SD	1	2	3	4	5	6	7	
1. Height (cm)	161.37	12.86								
2. Weight (kg)	51.00	11.77	.74**							
3. Age (years)	13.11	1.79	.20**	.22**						
4. Transformational Mothering	4.58	.41	-.07	-.02	-.01					
5. Transformational Fathering	4.55	.54	-.07	-.08	.01	.64**				
6. Transformational Coaching	4.26	.37	-.04	-.04	.05	.36**	.29**			
7. Mental Toughness	6.10	.62	-.04	.02	.04	.30**	.29**	.39**		
8. Performance	0.00	.51	.40**	.27**	.14**	-.06	-.05	.02	-.06	

Note. Bivariate correlations are reported at the individual level while controlling for the nested nature of the data, \*\* p < .01

was subtracted from each participants' global performance score.

For the multilevel analysis, the athlete team was included as a random effect to account for group-level nesting. Club level was included as a covariate to account for performance differences at different levels. Further, as a result of the substantial effect that advanced physical and biological maturation has upon fitness test performance (Lovell et al., 2015), athlete height and weight, were included as control variables in the performance model. Club level was included as a covariate in the mental

toughness model; however, height and weight were not included as covariates in the mental toughness model. For both models, the interactions between transformational mothering and athlete age, transformational fathering and athlete age, as well as transformational coaching and athlete age were included as predictor variables at the individual level. These models were simplified using backwards stepwise deletion with the stepAIC function of the MASS library in R (Venables & Ripley, 2002). The best-fitting model was selected as that with the lowest AIC value. Instances in which there was a significant

Table II. Table of coefficients, standard errors and Akaike Information Criterion (AIC) values of models explaining variation in mental toughness and performance.

Mental Toughness		AIC
1. Club level, TM*Age, TF*Age, TC*Age		518.60
2. Club level, TM, TF*Age, TC*Age		516.66
3. Club level, TM, TF*Age, TC		515.28
4. TM, TF*Age, TC		513.95
5. TF*Age, TC		512.90
<i>Final model</i>	<i>B (SE)</i>	<i>R<sup>2</sup></i>
Transformational coaching	0.44 (.09)	.08
Transformational fathering	0.36 (.07)	.08
Age	-0.09 (.05)	.03
Transformational fathering * Age	-0.24 (.06)	.04
<b>Performance</b>		
1. Height, Weight, Club level, TM*Age, TF*Age, TC*Age		444.06
2. Height, Weight, Club level, TM, TF*Age, TC*Age		442.08
3. Height, Club level, TM, TF*Age, TC*Age		440.15
4. Height, Club level, TM, TF, TC*Age		438.48
5. Height, Club level, TM, TC*Age		436.48
6. Height, Club level, TC*Age		435.41
<i>Final model</i>	<i>B (SE)</i>	<i>R<sup>2</sup></i>
Height	0.02 (.003)	.17
Club level (development)	0.43 (.09)	.13
Club level (performance)	0.40 (.08)	.13
Transformational coaching	0.04 (.07)	.001
Age	-0.19 (.05)	.06
Transformational coaching * Age	0.14 (.08)	.01

Note. Multilevel linear models were used with team was included as a random effect. The amateur level was included as the reference group for Club level. TM = Transformational Mothering, TF = Transformational Fathering, TC = Transformational coaching, Age = Athlete Age.



Figure 1. Interaction between transformational fathering and athlete age on athlete mental toughness. Age was plotted at -1 SD (11 years old) above the mean and 1 SD (15 years old) below the mean.

interaction in the best fitting model were followed up using a simple slopes analysis with the simple slopes function in the reghelper package in R (Hughes, 2020). Slopes for the moderator variable (age) were measured at -1 SD below the mean (11.86 years old) and 1 SD above the mean (15.34 years old).

**Results**

Descriptive statistics and bivariate correlations are reported in Table I. AIC values for each of the

Multilevel Linear Models are presented in Table II. As a preliminary analysis, a one-way ANOVA revealed no significant differences in mental toughness between club levels,  $F(2,311) = 1.30, p = .27$ . There were, however, significant differences in physical performance between club levels  $F(2,311) = 20.75, p < .01$ . Post-hoc Tukey tests revealed that, compared to athletes on the amateur teams, athletes on the performance teams,  $p < .01$ , and development teams,  $p < .01$ , performed significantly better.

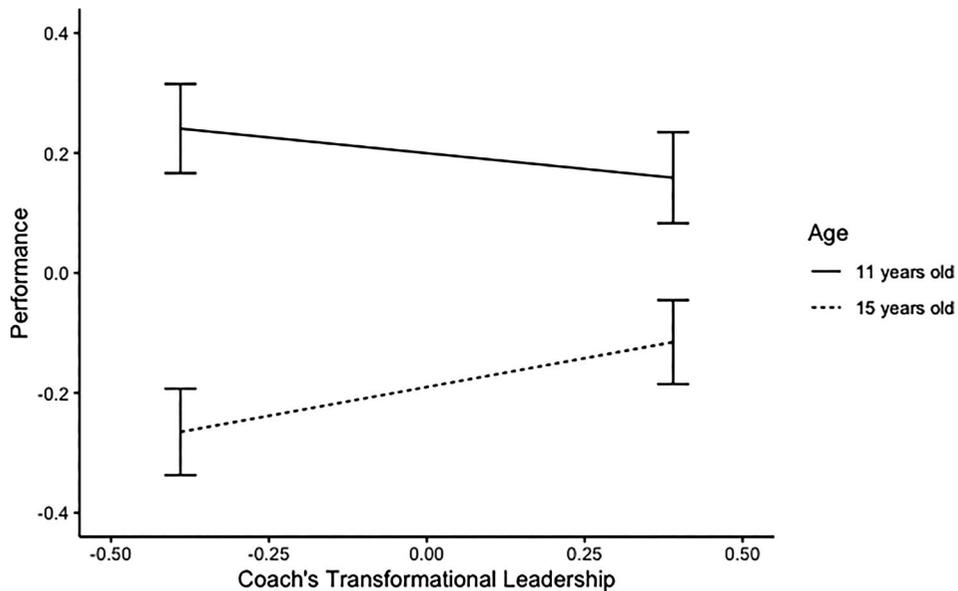


Figure 2. Interaction between transformational coaching and athlete age on athlete performance. Age was plotted at -1 SD (11 years old) above the mean and 1 SD (15 years old) below the mean.

*Multilevel models*

**Mental Toughness Model.** The best-fitting model included the interaction and lower order terms associated with transformational fathering and athlete age, as well as the main effect of transformational coaching ( $\Delta AIC$  relative to the next best fitting model = 1.05). There was support for Hypothesis 1a as the interaction between transformational fathering and athlete age was included in the best fitting model,  $b = -.24$ ,  $se = .06$ . As illustrated in Figure 1, follow up simple slopes analysis revealed a stronger positive relationship between transformational fathering and mental toughness among early adolescent athletes,  $b = .59$ ,  $se = .12$ , compared to the relationship between transformational fathering and mental toughness among later adolescent athletes,  $b = .12$ ,  $se = .07$ . The predicted interaction between transformational mothering and mental toughness, however, were not included in the best fitting model. Hypothesis 2a was not supported as the interaction between transformational coaching and athlete age was not included in the best fitting model. However, the main effect of transformational coaching was retained in the best fitting model, indicating that transformational coaching is positively associated with mental toughness regardless of age,  $b = .44$ ,  $se = .09$ .

**Performance Model.** The best-fitting model included control variables of height and club level, and the interaction between transformational coaching and athlete age ( $\Delta AIC$  relative to the next best model = 1.07). Height was positively associated with performance and athletes performing at a higher club level also demonstrated better performance. There was no evidence to support Hypothesis 1b as the interaction terms between transformational mothering and athlete age and transformational fathering and athlete age were not included in the best fitting model. Hypothesis 2b was supported as the interaction between transformational coaching and athlete age was included in the final model,  $b = .14$ ,  $se = .08$ . As illustrated in Figure 2, simple slopes analysis revealed a stronger positive relationship between coaches' transformational leadership and performance among later adolescent athletes,  $b = .19$ ,  $se = .11$ , compared to the weaker negative relationship among early adolescent athletes,  $b = -.11$ ,  $se = .11$ .

**Discussion**

The purpose of this study was to understand if the effects of transformational parenting and transformational coaching on mental toughness and physical performance vary as a function of age. As

such, two hypotheses were tested. Hypothesis 1a was partially supported as transformational fathering appeared to be positively associated with mental toughness in early adolescence. However, this did not appear to be the case for transformational mothering. Hypothesis 1b was not supported, however, as there were no relationships between transformational mothering or fathering and physical performance across adolescence. Hypothesis 2a was not supported as transformational coaching appeared to be associated with mental toughness regardless of age. Hypothesis 2b, however, was supported, as there was a positive association between transformational coaching and physical performance in late adolescent athletes compared to early adolescent athletes.

Researchers (e.g. Knight, Berrow, & Harwood, 2017) have stated the complexity of parental involvement in sport and the current study helps shed some light into this area. As expected, coaches appeared to be less influential than parents on early adolescents. Interestingly, transformational fathering was more strongly associated with early adolescents' mental toughness than transformational mothering. This finding is similar to previous research findings in that fathers are typically more influential on perceived physical activity capabilities (Gustafson & Rhodes, 2006; Morton et al., 2011) compared to mothers, who are instrumental in developing nutritional competencies in adolescent offspring (Morton et al., 2011; Scaglioni, Salvioni, & Galimberti, 2008). These results may be explained by sociological factors such as cultural norms pertinent to mothers' and fathers' roles in youth athlete development. That is, while both mothers and fathers are often involved in their children's sporting experience, fathers typically become more involved with the performance development aspect of the sport, more often assuming coaching and officiating duties compared to mothers (Coakley, 2006). As such, adolescents become more influenced by the behaviours of their fathers (e.g. transformational fathering) compared to the behaviours of their mothers (e.g. transformational mothering), at least in sport. Although the current sample consisted of only male athletes, it is noteworthy that fathers get more involved in their daughters' performance development compared to mothers (Neferetiti & Bopp, 2011), and as such, the current results might also be applicable to adolescent girls. Further research is needed to understand these differences in parental roles and to examine whether these trends are reversed when mothers are more involved in the performance development of their sons' and daughters'.

A positive relationship between transformational coaching and physical performance was observed

within later adolescent athletes (around 15–18 years old), but not early adolescent athletes (around 10–14 years old), indicating that transformational coaching might be more important during late adolescence. This supports previous findings that athletes who are in early adolescence are believed to be more receptive to influence by their parents, while those who are in late adolescence are believed to be more receptive to influence by coaches (Côté, 1999; Holt, 2016). Understanding that transformational coaching might help improve physical performance at later stages of adolescent development advances our theoretical and applied understanding that coaches play an instrumental role in athlete development, particularly during the training to compete stage of the Long Term Athlete Development Model (Balyi & Hamilton, 2004).

Overall, these results are important as they help us understand more about the impact of adolescent athletes' support network. There has been a wealth of research conducted to examine the physical aspects of athlete development (Ford et al., 2011). The results of the current study build on this research by offering evidence that, as athletes get older, their mental and physical development appears to be more influenced by coaches than parents. This might be because, as adolescents get older, they rely on their coach for instruction rather than their parents (Côté, 1999). Consequently, it might be that they are more attentive to the coach influence, and thus more receptive to their transformational leadership behaviours. These findings can be used to inform youth athlete performance development strategies. As athletes get older, the role of the coach appears to be more influential when it comes to performance development and, as such, interventions should be designed to facilitate performance development through instruction from the coach.

This aligns with the intervention conducted by Bell and colleagues (2013), who implemented a transformational leadership intervention through the coaching staff. Indeed, this intervention effectively improved mental toughness and performance in late adolescents. On the other hand, interventions aimed at developing early adolescent athletes' psychological skills should be developed through transformational parenting. Although Morton and colleagues observed that components of transformational parenting and authoritative parenting (Suldo & Huebner, 2004) are both positively correlated with positive outcomes such as adolescent satisfaction, transformational parenting offers a conceptually sound framework to implement interventions (Morton et al., 2011). This aligns well with recommendations by Harwood, Knight, Thrower, and Berrow (2019) who emphasised the importance of

parental involvement in the development of young adolescent athletes. Moving forward, researchers should explore whether transformational parenting explains changes in developmental outcomes beyond that of other parenting styles and how parenting interventions might be an important element to facilitate adolescent athlete development.

The current study was cross-sectional in nature; thus, direction of causality could not be confirmed. While, Arthur, Bastardoz, and Eklund (2017) argue that cross-sectional designs should not be used unless in the very early stages of theory development, the current research is the first to simultaneously examine parent and coach influences across different ages of adolescence to understand the association between mental toughness and performance. In light of the current results and in line with Arthur and colleagues' recommendations, further research could be conducted to understand causal associations between transformational parenting and coaching, mental toughness, and performance. Specifically, utilising a longitudinal design to examine how transformational leadership influences mental toughness over time, and whether changes in mental toughness are associated with performance improvements. Further research could also explore these effects within the context of different competition levels. While results indicated that physical performance was better at higher competition levels, no differences in mental toughness were observed. However, researchers using a heterogeneous sample of adults from various sports as well as non-athletes observed that more competitive athletes reported higher levels of mental toughness (Vaughan et al., 2018). Future research should explore whether these inconsistent results are due to differences in the ages of the sample, the type of sport being assessed, differences between measures of mental toughness (i.e. the MTI vs MTQ48), or another unknown variable.

Variables in this study were measured at the individual level while controlling for the multilevel nature of the data. Team-level variables (e.g. on field team performance) were not measured, and therefore, future research might examine the observed relationships at the team level. Indeed, researchers have observed that transformational coaching facilitates working better with teammates (Cronin, Arthur, Hardy, & Callow, 2015) and that transformational coaching is associated with better basketball team performance (Bormann & Rowold, 2016). Therefore, while the current study provided evidence that transformational coaching is associated with individual physical performance in late adolescence, these effects may be stronger for on field team performance. As such, researchers

should investigate whether transformational coaching improves team performance in later adolescence.

In summary, this research was the first to simultaneously examine the effects of parents and coaches' leadership on adolescent athletes. There was little evidence that parents influenced adolescents' performance on physical fitness tests. It may be instead, that parents, specifically fathers, are potentially more influential in fostering adolescents' psychological development such as mental toughness while coaches might be more influential in developing performance outcomes. Finally, if the results of this study can be replicated using causal research designs, we can suggest that exposing late adolescent athletes to coaches who demonstrate transformational leadership behaviours might be an effective strategy to help them improve their physical performance.

### Disclosure statement

No potential conflict of interest was reported by the author(s).

### Note

1. Items within the individualised consideration and inspirational motivation subscales were different from the copyrighted items associated with this scale.

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