

Relationships between implicit beliefs and mental toughness: The role of implicit beliefs of adolescent football players and their coaches

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Abstract

This study examined the association among adolescent football players' mental toughness, their implicit beliefs which is about their own ability, and their perceptions of coach's implicit beliefs. 322 adolescent football players completed the Korean Football Player's Mental Toughness Inventory, the Conceptions of the Nature of Athletic Ability Questionnaire-2, and the Questionnaire for Players' Perceptions of Coach's Implicit Beliefs. Player's mental toughness was positively associated with incremental belief about their own ability and their perception of coach's incremental belief, but no related with entity belief of those. The results further revealed that player's incremental belief about their own ability and perception of coach's incremental belief have a positively synergic effect on player's mental toughness. The current findings were discussed from the Social-cognitive model of motivation and Regulatory fit theory.

Key Words: *mental toughness, implicit belief, coaching, social-cognitive model, regulatory fit theory*

Introduction

Numerous studies have indicated that mental toughness (MT) plays a significant role in successful sports performance (Jones, Hanton, & Connaughton, 2007; Crust, 2007, 2008; Crust & Clough, 2011; Anthony, Gucciardi, & Gordon, 2016). In sports, athletes who sustain unprecedented victories, overcome all odds, persist in the face of adversities, and come from behind to win are often described as mentally tough players (Mahoney, Ntoumanis, Mallett, & Gucciardi, 2014). Based on the characteristics re-conceptualized by scientific qualitative and quantitative studies (Anthony et al., 2016; Gucciardi, Hanton, Gordon, Mallett, & Temby, 2015), MT has commonly been defined as 'a personal capacity to deliver high performance on a regular basis despite varying degrees of situational demands (see Gucciardi & Hanton, 2016). These conceptualizations suggest that MT may be less about which personal characteristics individuals have at their disposal and more about what these personal characteristics allow them to do (Mahoney et al., 2014). In this point of view, Jang (2018) defined the Korean Football player's MT as 'an ability to carry out personal performance in demanding situations without abandonment based on the self-confidence and desire to achieve a goal', and it consists of 3 factors (Striving, Surviving, and Confidence). This definition of MT reflected that the concept of MT can be perceived differently by athletes based on the sporting event's properties (Weinberg, Butt, & Culp, 2011), and should include the specific cultural values that Korean athletes possess (Kim & Gill, 1997).

Also, especially in young people and adolescents, MT has a positive relationship with adaptive reactions to stressful situations and a negative relationship with maladaptive reactions to perceptions of risk (Cowden, Clough, & Oppong Asante, 2017; Gerber et al., 2015; Haghghi & Gerber, 2018). Thus, the development of MT is an important issue for many researchers and practitioners considering positive youth development (Connaughton, Wadey, Hanton, & Jones, 2008; Golby & Wood, 2016; Weinberg, Freysinger, & Mellano, 2018). A considerable body of research has revealed that MT development is a complex endeavour that involves multiple mechanisms (e.g., exposure to challenging or tough situations) and sources of influence (e.g., coaches, teammates; Connaughton, Thelwell, & Hanton, 2011). In this, Smith (2006) suggested that the framework of social-cognitive theory could be useful in understanding behavioral signature such as MT in sport (see Harmison, 2011). Accordingly, it could be hypothesized that players' individual characteristics which is based on their perception about situation, expectations and values activated, and the emotional responses, are correlated with the development and enhancement of MT.

In the perspective of the Social Cognitive Model of Motivation (SCMM; Dweck, Chiu, & Hong, 1995; Dweck & Leggett, 1988, 2000; Molden & Dweck, 2006), it is proposed that individual differ with regard to their lay belief about the nature of human attribute, and these differences have an effect on task performance factors such as perception, motivation, and emotion. Also these implicit beliefs, otherwise termed mindsets (Dweck, 2017a, 2017b), have been proven to have an effect on athletes' cognitive, affective, and behavioral responses to occurrences in the context of competitive sports, as well as influence goals, self-regulations, efforts, and inner

motivation (see Vella, Braithewaite, Gardner, & Spray, 2016). In sports situations, implicit beliefs are conceptualized as the entity and incremental beliefs about athletic ability (Biddle, Wang, Chatzisarantis, & Spray, 2003; Wang, Liu, Biddle, & Spray, 2005). Athletes with ‘incremental beliefs (or growth mindset)’, which is the belief that ability changes over time and open to development, will attempt a difficult challenge unrestrained by previous. On the other hand, athletes with entity beliefs (or fixed mindset), which is the belief that ability is intrinsic and thus stable trait-like whose opportunities for change or development are not within one’s control, tend to take on relatively easier challenges to avoid the possibility of failure (Jowett & Spray, 2013; Vella et al., 2016; Yeager & Dweck, 2012). In this point, it is expected that athletes’ entity and incremental beliefs about own ability are closely related to MT—an ability to carry out personal performance in demanding situations without abandonment based on the self-confidence and desire to achieve a goal. Especially, it is predicted that having incremental belief is positively associated with MT, because it is related to adaptive outcomes such as effort, persistence, willingness to seek out challenge, and intensity of physical activity (Vella et al., 2016). Likewise, the SCMM (Dweck, 2009, 2017a, 2017b) suggests that contextual factors, such as a coaching style, could affect athlete’s achievement goals and behavioral response. As a social-cognitive personality construct, the MT can be affected by the person-situation interaction (Harmison, 2011). Numerous studies contribute an impressive body of research which has supported the effect of coaching behavior to the development and enhancement of MT (Weinberg et al., 2018; Anthony, Gordon, Gucciardi, & Dawson, 2018; Anthony et al., 2016). Specifically, several studies by Mahoney and colleagues (Mahoney et al., 2014; Mahoney, Gucciardi, Ntoumanis, & Mallet, 2014; Mahoney et al., 2016) have revealed that social context, such as coaching behavior and supportive environment, contribute to the enhancement of MT through various psychological mechanisms. A qualitative study by Gucciardi et al. (2009) reported that the athlete-coach relationship and the coach’s philosophy play a considerable role in fostering the development of athlete’s MT.

Given this context, player’s perceptions of their coach’s implicit beliefs are predicted to play an important role in the development and enhancement of MT in adolescent football players (Chase, 2010; Vella & Gilbert, 2014). This idea was indirectly supported by Golby and Wood (2016), which examined the effect of psychological skills training based on Dweck’s (2009) theory of an implicit belief to develop MT of student-athlete. Golby and Wood’s strategies, such as modifying feedback, avoiding statements which attribute success to innate qualities and instead praising effort and practice, indicates that intervention based on incremental belief can enhance MT as well as psychological well-being. These findings can be explained from two perspectives in the context of corporate (Heslin & VandeWalle, 2008; Lin, Lin, & Chang, 2017; Whiteley, Sy, & Johnson, 2012; Aryee, Budhwar, & Chen, 2002). First, the self-fulfilling prophecy states that the manager’s (coach’s) internal belief was converted to expectations for the employees (players), which affected their motivation. Secondly, based on the leader-member exchange theory, if manager (coach) held incremental beliefs, the employees (players) perceived that they are treated favorably by he/she, and thus tried to live up to the manager’s (coach’s) belief by displaying positive attitudes or behaviors. Thus, it could be hypothesized that the perception of their coach’s implicit belief could be a critical variable that determine the development and enhancement of MT. This is an important consideration because, despite the evidence of coaching in corporate situations, this theoretical assumption had yet to be empirically tested in sports coaching context.

In summary, the current study drew from the SCMM framework in an attempt to investigate the nature of the relationship between ‘implicit beliefs as a social-cognitive system’ and ‘MT as a behavioral signature of athlete.’ Specifically, this study aims to examine whether adolescent football players’ MT is associated with their implicit beliefs which is about their own ability, and perceptions of their coach’s implicit beliefs. Consistent with existing research, it was hypothesized that players endorsing higher incremental beliefs of both their own and their coach will report higher levels of MT. Moreover, in support of regulatory fit theory (see Sue-Chan, Wood, & Latham, 2012), it was expected that the perceptions of incremental beliefs of their coach would have a more positive effect on the MT of players with incremental beliefs about own athletic ability.

Material & methods

Participants

Korean middle/high school football players who participated in a weekend league hosted by the Korean Football Association were selected to participate in this survey study. They play matches every week during the amateur league’s football season (nine months of the year, from March to October, with a month-long break in July). Participants comprised 322 football players (all male) between 13 to 18 years of age ($M=15.02$, $SD=1.64$) from middle-school teams ($n=201$, 62.4%) and high-school teams ($n=121$, 37.6%).

Ethical consideration and procedure A survey was conducted using questionnaires to measure adolescent football players’ perceptions of MT and implicit beliefs. In order to avoid ethical issues, all processes, including participant recruitment, research procedures, and methods, were confirmed by the institutional research ethics committee prior to the start of the study. After ethical approval, the coach of each team and parents of each athlete were contacted and informed about the study. If they gave consent for the researchers to approach their team, they were asked to set aside 15 min at the beginning of a training session. Before the questionnaires were distributed, verbal and written instructions were given and athletes signed an informed consent form. The questionnaires took approximately 10–15 minutes to complete

Measure

Korean Football Mental Toughness Inventory (KF-MTI; Jang, 2018) was used to measure the MT of adolescent football players. It consists 15 items assessing 3 qualities (e.g., striving—“I commit to my performance until my goal is achieved;” surviving—“I use effective skills or knowledge to overcome situational demands;” confidence—“I have the ability to achieve the level of performance required to win”). The participants were to provide responses to the questions assuming they were participating in competitive sports. Responses ranged from 1 (Not at all) to 5 (Very true), and a total score on this questionnaire was averaged to create mean score for MT (Cronbach’s $\alpha = 0.92$).

The Conceptions of the Nature of Athletic Ability Questionnaire-ver.2 (CNAAQ-2; Wang et al., 2003) was used to measure the player’s implicit beliefs. The CNAAQ-2 contained two major categories (incremental and entity) and was further divided into four subscales (incremental beliefs: Learning, Improvement; entity belief: Stable, Gift). This questionnaire comprised a total of 12 questions (three items for each subscale), participants were asked to respond on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). In the current study, sum score of each two major categories are averaged to assess incremental belief and entity belief. In this study, 322 survey responses were analyzed using confirmatory factor analysis (CFA) and construct validity testing. This eliminated six items (incremental: 3 items, entity: 3 items) with a standardized regression weight lower than 0.5, and the validity of the measurement model was verified by considering the fit index in the structural equation model. The final survey contained three questions each on incremental ($\alpha = 0.86$) and entity ($\alpha = 0.77$) beliefs, making up a total of six questions.

- *The Questionnaire for Players’ Perceptions of Coach’s Implicit Beliefs:*

Drawing from the CNAAQ-2, we developed two 3-item subscales designed to measure the players’ perceptions of their coach’s implicit beliefs (e.g., incremental—“My coach believes that people can substantially change the athletic ability;” entity—“My coach believes that the athletic ability cannot be changed considerably”). The participants were to provide responses to the questions assuming their coach’s coaching behavior in their relationship with their players. Responses ranged from 1 (strongly disagree) to 5 (strongly agree), and was averaged to create a mean score for entity and incremental beliefs. Cronbach’s alpha supported the internal reliability of both incremental ($\alpha = 0.87$) and entity ($\alpha = 0.84$) beliefs.

Statistical analysis

The analysis was conducted in the following steps: First, a confirmatory factor analysis was conducted to test the measurement model for measures of the MT and implicit beliefs variables. Second, Pearson correlations assessed the bivariate relationships between measures of adolescent football players’ MT, implicit beliefs which is about their own ability, and perceptions of their coach’s implicit beliefs. Third, multiple regression analysis was used to examine whether the level of MT was predicted by the dimension of implicit beliefs which is about their own ability, and perceptions of their coach’s implicit beliefs. The interaction hypotheses were then tested with hierarchical regression with MT as the dependent variable. The scores of player’s implicit beliefs and coach’s implicit beliefs were entered first, followed by the interaction term for those two variables. Following Aiken et al. (1991), all three predictor variables were centered to minimize multicollinearity. The interactions were graphed, as described by Aiken et al., who recommended depicting low and high values of the predictor variable at 1 standard deviation below and above the mean. The statistical significance for all analyses was set to 0.05

Results

A confirmatory factor analysis (CFA) was conducted to test the measurement model for measures of the five variables: (a) MT; (b) player’s entity beliefs; (c) player’s incremental beliefs; (d) coach’s entity beliefs; and (e) coach’s incremental beliefs. This analysis revealed that when each item was forced to load only on its respective factor, the five-factor model fitted the data well (comparative fit index [CFI] = 0.954, Tucker-Lewis index [TLI] = 0.948, root mean square error of approximation [RMSEA] = 0.045), whereas a single factor model did not (CFI = 0.515, TLI = 0.475, RMSEA = 0.144). These results provide evidence of the discriminant validity of the scales used in this study. And the results of the CFA for each measurement model are presented in Table 1.

Table 1. *Results of the CFA*

	χ^2	<i>df</i>	<i>p</i>	CFI	TLI	RMSEA
Model 1	218.384	87	< 0.001	0.950	0.940	0.069
Model 2	4.846	8	0.774	1.000	1.008	0.000
Model 3	17.357	8	0.027	0.989	0.980	0.060

Note. Model 1: KF-MTI; Model 2: CNAAQ-2; Model 3: Questionnaire for Players’ Perceptions of Coach’s Implicit Beliefs

The Descriptive statistics, bivariate correlations, and, and Cronbach’s alpha coefficients for the variables are shown in Table 2. Measures of skewness (i.e., < 2) and kurtosis (< 4) found the data to be normally

distributed, and the reliability coefficient of the measurements was appropriate (Cronbach's $\alpha=0.768\sim 0.920$). In terms of bivariate correlation coefficient, the dependent variable MT had a significant positive correlation with the independent variables "entity beliefs" (player's: $r=0.109$, $p<0.05$ / coach's: $r=0.111$, $p<0.05$) and "incremental beliefs" (player's: $r=0.385$, $p<0.01$ / coach's: $r=0.315$, $p<0.01$).

Furthermore, the demographic variable "age" had a significant positive correlation with players' entity beliefs ($r=0.132$, $p<0.05$) but a significant negative correlation with players' incremental beliefs ($r=-0.122$, $p<0.05$), coach's incremental beliefs ($r=-0.147$, $p<0.01$), and MT ($r=-0.191$, $p<0.01$).

Table 2. Descriptive statistics, bivariate correlations, and internal consistency

Variables	<i>M</i>	<i>S</i> <i>D</i>	1	2	3	4	5	6
Player's Age	-	-	-					
Players' entity beliefs	3.87	0.73	0.132*	(0.768)				
Players' incremental beliefs	4.32	0.70	-0.122*	0.084	(0.855)			
Coach's entity beliefs	3.16	0.83	0.066	0.406**	0.038	(0.841)		
Coach's incremental beliefs	4.30	0.64	-0.147**	0.087	0.495**	0.008	(0.865)	
Mental toughness	4.19	0.53	-0.191**	0.109*	0.385**	0.111*	0.315**	(0.920)

Note 1. The diagonal brackets refer to the coefficient of internal consistency for the variable. Note 2. ** $p<0.01$, * $p<0.05$.

Based on the research hypotheses, entity and incremental beliefs were set as a predictor variable. Multiple regression analysis was conducted using MT as a criterion variable. Using the step selection method, the results of the final regression model were to be predicted.

Table 3 shows that both incremental beliefs of player ($\beta = 0.289$, $p < 0.001$, 95% confidence interval [CI] = $0.13 < b < 0.31$) and coach ($\beta = 0.206$, $p < 0.001$, 95% [CI] = $0.08 < b < 0.26$) have a positive effect on MT. However, both entity beliefs of those was excluded as a predictor in the model.

Table 3. Results of the statistical hypothesis test through multiple regression analysis

Criterion variable	Predictor variable	B	SE	β	<i>t</i>	VI F
	(Constant)	2.518	0.202		12.492***	
Mental toughness	Players' incremental beliefs	0.220	0.044	0.289	4.997***	1.309
	Coach's incremental beliefs	0.169	0.047	0.206	3.561***	

Note 1. $R^2=0.184$, Adjusted $R^2=0.179$, $F=35.972$ ***

Note 2. *** $p<0.001$

In support of interaction hypotheses, Table 4 shows that the interaction terms for player's incremental beliefs and coach's incremental beliefs were significant and positive for MT ($B = 0.191$, $p < 0.001$, 95% [CI] = $0.06 < b < 0.32$).

The significant interactions are shown in Figure 1. The effect size ($f^2 = 0.025$) was larger than the small effect size of 0.02 (Cohen, 1992).

Table 4. Interactive effects of incremental beliefs of player and coach on MT

Criterion variable	Mental toughness				
	B	<i>t</i>	<i>R</i> ²	ΔR^2_z	<i>F</i>
Players' incremental beliefs	0.220	4.997*	0.184	-	35.972*
Coach's incremental beliefs	0.169	3.561*			*
Players' incremental beliefs	0.239	5.439*			
Coach's incremental beliefs	0.177	3.759*	0.204	0.020	27.224*
Interaction term	0.189	2.850*			

Note 1. The interaction term was calculated by multiplying mean-centered player' and coach's incremental beliefs.

Note 2. *** $p < 0.001$, ** $p < 0.01$

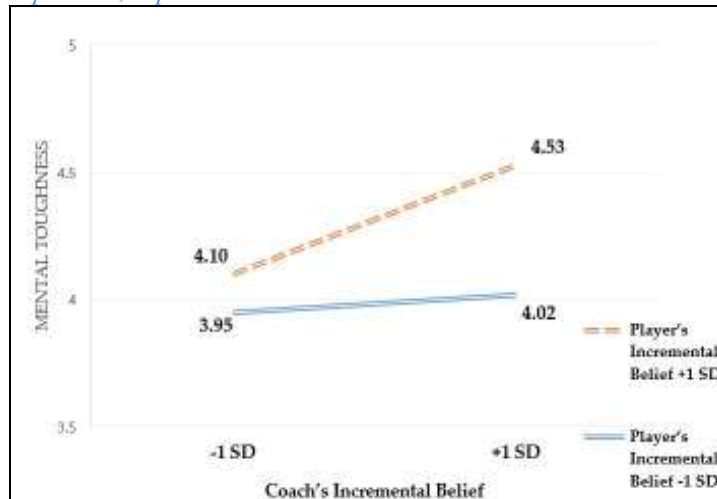


Figure 1. Interactive effects of incremental beliefs of player and coach on MT

Discussion

The primary aim of this study was to investigate the nature of the relationship between 'implicit belief as a social-cognitive system' and 'mental toughness as a behavioral signature of athlete.' The present study indicated significant associations between implicit beliefs in the possibility of change in athletic ability and MT of adolescent football players. Specifically, we identified only incremental beliefs were proven to have significant positive effects on MT, and player's incremental belief about their own ability and perception of coach's incremental belief have a positively synergic effect on player's MT. Using correlation analyses, player's age was determined to have significant negative relation with MT. Based on the results of this study, further studies should consider the following.

First, consistent with our hypotheses, incremental beliefs were associated with higher levels of MT. It means that adolescent football players with high levels of MT endorse implicit beliefs about athletic ability. This is supported by the SCMM of Dweck (2017a, 2017b), who proposed that incremental beliefs are related to an adaptive response, while entity beliefs are related to a nonadaptive response in continuing learning and task performance. Although entity beliefs also related to self-motivation, which is the desire to fully prove one's own (stable) abilities (Dweck et al., 1995), there was no significant association between entity beliefs and MT in this study. It could be a limitation that the tool to measure implicit beliefs (CNAAQ-2) was designed to detect two contradictory beliefs (incremental and entity) about the nature of athletic ability. Gucciardi et al. (2015) revealed that nearly half of the people could not be classified as incremental or entity theorists, and there was no embodiment of entity beliefs. Future study is necessary to test the essential existence of the entity beliefs, and

may benefit from considering implicit beliefs as a lay belief in the possibility of change ability (rather than isolation of incremental and entity).

Second, higher MT was not only associated with incremental beliefs about their own ability, but also with perceptions of their coach's incremental beliefs. This observation can be explained from two perspectives: the self-fulfilling prophecy and/or the leader-member exchange theory (Heslin & VandeWalle, 2008; Lin et al., 2017; Whiteley et al., 2012; Aryee et al., 2002). In addition, interactive effects were confirmed by the fact that players' perceptions of coach's incremental beliefs positively enhanced the relationship between the player's incremental beliefs and MT. Although the regression equation's effect size was not large when calculated for the interaction of the variables ($f^2 = 0.025$), it was deemed of practical significance. This is supported from regulatory fit theory (see Sue-Chan, Wood, & Latham, 2012), which proposed that performance improves when coaching orientations and recipients' implicit beliefs coincide. Future study may benefit from comparing it with behavioral fit performance (Su, Murdock, & Rounds, 2015) or coach's own implicit beliefs, which is not player-reported perceptions.

Third, it was an unexpected finding that as age increased, perceptions about entity beliefs increased, but incremental beliefs and MT decreased. This observation supports the findings that changes in ability beliefs can occur based on adolescent development stages (Fredricks & Eccles, 2002; Wigfield et al., 1997), and that MT can also change based on the social environment (Gucciardi et al., 2015; Weinberg et al., 2018; Li, Martindale, & Sun, 2019). In the current study, despite the cross-sectional nature of our design, an age-based reduction of implicit beliefs in the possibility of change in athletic ability seems to cause a decrease in MT. These observations are thought to be due to the increase in the number of failure experiences with increasing age (Akca, 2011). Experimental manipulations of implicit beliefs and MT are required to make inferences about causality, whereas longitudinal designs have the potential to offer insights into the in/stability of those relationships.

Conclusions

To conclude, our study offered important contributions to the study of both implicit beliefs and MT in the perspective of SMCC. It is the first study to explore the relationship between implicit beliefs and MT within the sporting domain. It is also the first study to incorporate perceptions of coach's implicit beliefs as a possible moderating factor linking of that relationship. Most important, the study investigates these novel relationships using the SCMM as a theoretical framework. We explored the relationship between 'implicit belief as a social-cognitive system' and 'mental toughness as a behavioral signature of athlete,' and presented some evidence supporting it. In order to improve the MT of adolescent football players, who are exposed to continuous and repetitive competitive environments, players need to perceive their own potential as well as coach's incremental beliefs. Despite the limitation of measurement tools and the cross-sectional nature of the study, the findings could be utilized in the development of interventions to promote MT through incremental-strategy coaching behavior.

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Declaration of Conflicting Interests

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