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Research article

Influence of Perceived Physical Literacy on Coaching Efficacy and Leadership Behavior: A Cross-Sectional Study

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Abstract

The concept of physical literacy has evolved to work as a guiding ideology in physical education, physical activity and heath, while little is known for coaching context. The purpose of this study was to examine the influence of perceived physical literacy (PPL) in predicting coaching efficacy and leadership behavior from the perceptions of student-athletes in Hong Kong secondary schools. A total of 352 (200 boys, 152 girls) student-athletes (14.78 ± 1.73 years old) participated in this study. Perceived Physical Literacy Instrument (PPLI) for adolescents, Coaching Efficacy Scale (CES) and Leadership Scale for Sport (LSS) for student-athletes were adopted to assess the student-athletes' self-reported PL, perceptions of coaching efficacy and leadership behavior, respectively. Hierarchical linear regressions revealed that student-athletes' knowledge and understanding of physical literacy significantly predicted all the dimensions of coaching efficacy (18%-23%, $p<0.01$) and leadership behavior (15%-27%, $p < 0.05$) except for autocratic behavior after controlling for the effects of demographic variables (such as age, gender, and training experience). The PPL attribute of Sense of Self and Self-confidence also demonstrated significant predictions with coaching efficacy (17%-19%, $p < 0.01$), while the PPL attribute of Self-expression and Communication with others only significantly predicted social support behavior (14%, $p < 0.05$). Path analysis showed PPL of student-athletes has significant predictions to their perceptions of coaches' leadership and this relationship was partially mediated by their perceptions of coaching efficacy ($\beta = 0.57$). Discussion highlights that this study is the first empirical study to explore PPL in the coaching context and its strength in predicting coaching effectiveness. The study provides a new perspective for coaching education programs or coach-oriented interventions by emphasizing the concept of physical literacy.

Key words: Perceived physical literacy; coaching effectiveness; student-athletes' perceptions.

Introduction

The concept of physical literacy (PL) has drawn growing attention in the areas of health and physical education over the past decade. PL has been defined as "the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life" (Whitehead, 2016). In response to a global decline in children's and adolescent's physical activity participation, many countries who rank within the top 25 for obesity prevalence have embraced PL as the guiding ideology in their policies and programs (Spengler, 2014). This rationale has been premised on theorizations that PL individuals have more optimal chances to grow healthily in the physical, mental, and psychosocial domains (Corbin, 2016; Giblin et al., 2014; Longmuir and Tremblay, 2016; Roetert and MacDonald, 2015). The evolving interpretations of PL have emphasized a holistic embodiment to establish purposeful physical pursuits of an active lifestyle (Whitehead, 2010) and has been espoused to be a vital component of a healthy culture in which individuals live (Delaney and Donnelly, 2008).

PL is a multidimensional construct that has been examined within different epistemologies. One of these perspectives is the notion of perceived physical literacy (PPL), which is an individual's perceived capability in pursuing healthy and active lifestyle. Sum et al. (2016) identified three attributes of PPL in the process of construction and validation of a Perceived Physical Literacy Instrument (PPLI) for PE teachers, including Knowledge and Understanding (K&U), Self-expression and Communication with others (SE&C), and Sense of self and Self-confidence (SS&S). K&U depicted that a physically literate individual should have a better knowledge and understanding of the benefits of being physically active; SE&C showed that a physically literate individual should possess better self-expression and communication skills; and SS&S expressed that a physically literate individual should have a better sense of self and self-confidence (Sum et al., 2016). This model echoed with several of the kernel attributes of PL concept proposed by Whitehead (2010). Meanwhile, the multifaceted dimensions of PL have also included perceived competence or the ability of an individual to "read" a game or interpret movements (Flemons, 2013). Each of the dimensions is valuable in contributing to the promotion of lifelong p hysical activity (Whitehead, 2010). Although PL has been both widely explored in physical activity settings and is regarded as the educational requirements for physical education (Mandigo et al., 2007), little emphasis has been given to PL's strength in the coaching context.

Physical literacy and coaching contexts

Professional organizations across different countries (e.g. Youth Sport Trust in the UK, Canadian Sport for Life) view coaching as essential contexts during an individual's PL journey. While several studies have examined the potential connections between PL and coaching (Gallant et al., 2011; Haughey et al., 2013; Sullivan et al., 2010), only one case study has provided empirical evidence to highlight the important influence of PL knowledge in the coaching practice (Sullivan et al., 2010). The research has incorporated the knowledge, skills, and attitudes of PL into

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coach education curriculum on two stages of athlete development and emphasized that how to understand and apply the knowledge of PL on coaching is imperative for coaches in all sports. As a disposition that establishes purposeful embodiment for active lifestyle, higher levels of PL should facilitate longer-term involvement in the specific physical activities (Whitehead, 2010) and generate more confidence and physical competence for coaching behaviors(Sullivan et al., 2010). However, little is currently known of the influence of athletes' PL in the coaching practice and their PPL's influence on their confidence, physical competence and behavior from athletes' perspectives.

As a construct referring to confidence in the coaching context, coaching efficacy (CE) was defined as the extent to which a coach believes in the personal capacity to affect the learning and performance of the athletes (Feltz et al., 1999). Researchers have identified several sources of CE, such as coaching experience/preparation (Sullivan et al., 2006), and previous performance success (Feltz et al., 2008; Chase et al., 2005). More recent studies have highlighted the importance of athletes' perceptions on CE in the coaching context (Boardley et al., 2008; Horn, 2002; Myers et al., 2006a; Kavussanu et al., 2008). For example, Boardley et al. (2008) found that athletes' perceptions of CE influenced the effectiveness of coaching by emphasizing the positive correlation between athletes' commitment, enjoyment, and self-efficacy to their perceptions of CE. These factors referred to both physical and psychological dimensions of athletes, which was the embodiment of athletes' interconnected capabilities. As Whitehead (2010) described an individual as "an indivisible entity comprised of reciprocally enriching modes of interacting with the world" (p.12), this idea aligned with philosophical foundations of the concept of PL. Therefore, athletes' PPL has had the potential to influence their perceptions of CE. Another potential source of embodiment which has received less attention is the understanding of athlete motivation, expression and regulation of self within the coaching context and how it interconnects with coaches' behaviors (Hwang et al., 2013). This potential of reciprocity between athlete and coach provides a theoretical justification for examining the relationship between the athletes' PPL and their perceptions of their coaches' efficacy.

Feltz et al.'s (1999) model also suggested a primary outcome of CE was coaching behaviors. They summarized that behavioral outcomes included praise/encouragement, instruction/organization, and punishment/control. One important style of coaching behavior was leadership behavior (LB). Chelladurai (1999) constructed the multidimensional model of leadership in sport, which recognized that LB was largely a function of leaders' personal attributes. A large body of studies (Horn, 2002; Hwang et al., 2013; Kavussanu et al., 2008; Myers et al., 2005; Sullivan and Kent, 2003; Sullivan et al., 2012) have provided empirical evidence that as a personality attribute, CE was a strong predictor of LB. Sullivan and Kent (2003) for example, revealed that the more confident coaches were in motivating and teaching techniques the greater the frequency of leadership behaviors they showed to athletes. However, the relationship between CE and LB from athletes' perspective has not received the same level of attention. Chelladurai (1984) found that a discrepancy exists between preferred and perceived LB among athletes, indicating athletes' perceptions of LB are important to consider. Studies from several countries including Canada (Saville and Bray, 2016), Singapore (Pyun et al., 2010), Africa (Boardley et al., 2008; Surujlal and Dhurup, 2012) have shown that athletes' perceptions of their coaches' efficacy were related to their perceptions of LB. These findings lent support to evidence that athletes' perceptions of CE influenced their perceptions of coaches' LB. While Whitehead (2001) suggested that PL is the embodiment that includes self and social motivation, self-regulation, and responsible decision-making, the attributes of PL also may have close connections with the motivational factors and decision-making factors in coaches' LB.

A working model of coaching effectiveness (Figure 1) showed that CE can be regarded as one of the coaches' personal characteristics that influence coaching effectiveness, the leadership style of coaches' behavior is a direct style of behavior to influence coaching effectiveness (Hwang et al., 2013). More importantly, athletes' self-perceptions, beliefs, and attitudes directly reflect their behavior, while athletes' perception, interpretation, and evaluation of their coaches' could indirectly impact athletes' performance and behavior (Horn, 2002). A few studies consistently compared the reports of coaches and athletes towards coaching effectiveness and found coaches rated their behaviors substantially more positively than their athletes did (Kenow and Williams, 1992; Kavussanu et al., 2008). Therefore, exploring the possible strength of PPL on CE and LB from the perceptions of athletes is of paramount importance.

The purpose of the present study was to explore the possible influence of PPL on coaching from the perceptions of student-athletes. As CE directly produced outcomes in behaviors and PPL had the potential for influencing LB, another purpose of this study was to examine the mediation effect of CE in the prediction from PL to LB. It was hypothesized that (i) the attributes of PPL of student-athletes would positively predict their perceptions of CE; (ii) the attributes of PPL of student-athletes would positively predict their perceptions of LB; (iii) the mediation effect of CE exists in the prediction from PPL to LB. Figure 2 summarizes the theoretical framework of the relationship between PPL, CE and LB.

Methods

Participants

Participants were 352 secondary-aged student-athletes from Hong Kong schools, with 200 males (56.8%) aged between 11 years and 18 years (M = 14.83, SD = 1.64) and 152 females (43.2%) aged between 11 years and 21 years (M = 14.72, SD = 1.85). Years for training in school teams ranged from 0.25 to 11 years. The participants competed in individual (i.e., field and track, swimming, table tennis, badminton, cross-country, rope skipping, and trampoline) and team sports (i.e., basketball, volleyball, football, handball, baseball, dodgeball, ice hockey, korfball, and rugby).

The student-athletes in each school were competing in the Inter-secondary Schools Sports Competitions in local district in Hong Kong. These chosen schools were similar in size, schedule of extracurricular or competitive sports, location (urban or suburban area) and socio-economic status of the families in the area they served.

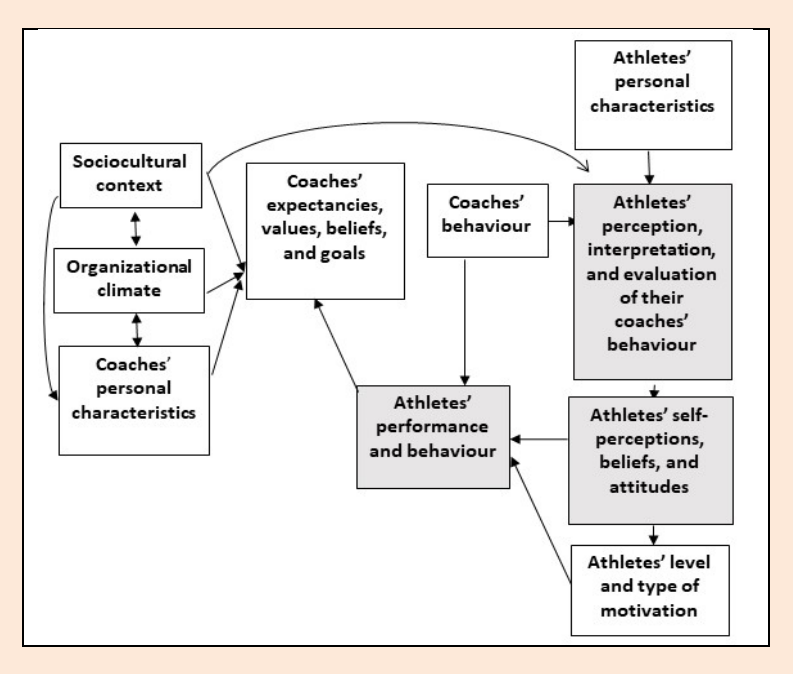

Figure 1. **A Working Model of Coaching Effectiveness (Horn, 2002).**

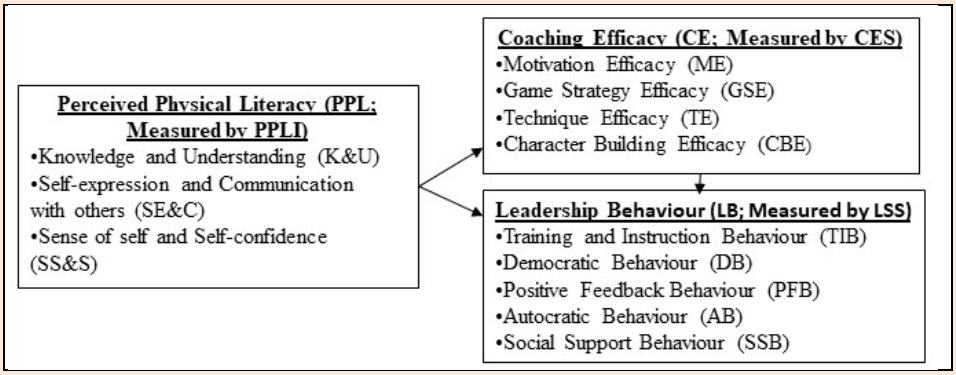

Figure 2. **Conceptual Model of Perceived Physical Literacy (PPL), Coaching Efficacy (CE), and Leadership Behaviour (LB).**

Measures

PPL was measured using the adolescents' version of Perceived Physical Literacy Instrument (Sum et al., 2018a), which was a questionnaire developed from the initial version of Perceived Physical Literacy Instrument (Sum et al., 2016) for physical education teachers. The self-report questionnaire has 9 items consisting of three attributes (see Figure 2): Knowledge and Understanding (K&U, e.g. "I have a positive attitude and interest in sports"), Self-expression and Communication with others (SE&C, e.g. "I am capable in handling problems and difficulties"), and Sense of self and Self-confidence (SS&S, e.g. "I possess self-management skills for fitness"). Responses were rated on a 5-point Likert scale ranging from strongly disagree to strongly agree. The model echoed with the kernel attributes of the concept of PL proposed by Whitehead (2010). The adolescent version of PPLI was previously validated with this population (Sum et al., 2018a). Confirmatory factor analyses (CFA) were performed to confirm the three-factor structure derived in the analysis using the first subset. The fit statistics were all adequate as follows: chi-square ($\chi 2$ = 321.54, df = 24, $p < 0.05$), CFI =.95, RMSEA = 0.08, SRMR = 0.04. The questionnaire also showed an acceptable reliability with α values ranged from 0.68 to 0.76. In the present study, subscale internal consistencies were: K&U α = 0.78; SE&C α = 0.69; SS&S α = 0.72. As the alpha value of SE&C was very close to Nunnally's (1978) acceptable reliability coefficient of 0.70, the subscale was retained for analysis.

Student-athletes perceptions of CE were measured with the Coaching Efficacy Scale (CES) (Feltz et al., 1999), a 24-item questionnaire consisting of four dimensions: Motivational Efficacy (ME), Game Strategy Efficacy (GSE), Technique Efficacy (TE), and Character Building Efficacy (CBE) (see Figure 2). The student-athletes were informed that CE was related to how effective coaches believe that they could influence the learning and performance of student-athletes. CFA was performed pre-

viously with one item ("how effective is your coach in his ability to mentally prepare his athletes for game strategies") removed to achieve an acceptable fit, Rχ2 (224) = 348.45, Rχ2/df = 1.56, RCFI = 0.90, RMSEA = 0.06, SRMR = 0.05, CAIC = –1021 (Boardley et al., 2008). All items began with the statement "How effective is your coach in his/her ability to…". Each item was rated on a 10-point Likert scale ranging from 0 (not effective at all) to 9 (completely effective). A Chinese version of CES was translated and used with satisfactory reliability (α values range 0.88 - 0.91) and construct and content validity (Chen, 2004). All subdomains of CE showed acceptable levels of internal consistency: ME α = 0.93; GSE α = 0.91; TE α = 0.93; and CBE α = 0.93.

Student-athletes' perceptions of LB were measured via the Leadership Scale for Sports (LSS) (Chelladurai, 1990). This 40-item self-reported questionnaire contained five leadership dimension factors: Training and Instruction Behavior (TIB), Democratic Behavior (DB), Positive Feedback Behavior (PFB), Autocratic Behavior (AB), and Social Support Behavior (SSB) (see Figure 2). Each item was scored on a 5-point Likert scale with higher scores indicating higher levels of perceptions in their own coaches' LB. LSS could be used for three purposes (e.g., student-athletes' perceptions (Garland and Barry, 1988), student-athletes' preferences, and coaches' self-reports), each of which was validated in previous literature (Chelladurai and Saleh, 1980). The psychometric properties of the LSS was tested and showed a fair fit to the data, χ2 = 1493.24, χ2/df = 2.05, RMSEA = 0.061 (CI = 0.057, 0.063, p < 0.01), CFI = 0.97, NFI = 0.93 (Kwon et al., 2009). For the Chinese version adopted in the present study, acceptable reliability α values ranged between 0.70 and 0.89 (Cheng, 1997). For the current study, subscale internal consistencies were: TIB α = 0.90; DB α = 0.85; PFB α = 0.75; AB α = 0.73; SSB α = 0.77. The internal consistency of the questionnaire in the current research was α = 0.92.

Procedures and data analysis

Upon approval by the University Survey and Behavioral Research Ethics Committee, invitation emails were sent to-secondary schools for recruitment. Informed consent forms were distributed to head coaches who were in charge of specific student-athletes. Data were collected before or after student-athletes' training sessions. Prior to filling out the questionnaires, student-athletes were reassured that their answers were completely anonymous and voluntary and would not be shown to their coaches. The response rate was 98.1% (358 of 365 questionnaires were returned). Data screening showed 5 incomplete cases and 1 invalid case, all of which were excluded. The remaining cases included 352 participants for analysis. Expectation-maximization (EM) was used to replace missing values in each variable, as analysis revealed that data was random missing (Bennett, 2001) and the missing rate was less than 5% of the entire values.

Descriptive statistics including means, standard deviations, skewness, kurtosis, Cronbach's alpha, and Pearson correlation of all the study variables were calculated. Hypotheses were tested with SPSS 20 by conducting hierarchical linear regressions (HLRs) to control for the effects of demographic variables (i.e., age, gender, years of sport, etc.). Path analysis was conducted to examine the direct or indirect predictions from PPL to LB. Alpha level was set at $p < 0.05$ for all statistical tests.

Results

The purpose of the present study was to explore the possible influence of PPL on coaching from the perceptions of student-athletes. Table 1 presents descriptive statistics and the correlation matrix among the measured variables for the entire sample. Skewness and kurtosis values were within acceptable limits of ±2, indicating a reasonable assumption of normality (Gravetter and Wallnau, 2014). Participants reported the highest mean score in the K&U dimension of PPL. CBE had the highest reported mean score among all four subdomains of CE, thereby implying that student-athletes perceived the most confidence of coaches in influencing their character. PPL was positively correlated with all dimensions of CE and LB, except for AB. All subdomains of CE showed positive correlations with LB, except for AB. Multicollinearity existed among the dimensions of CE (VIF value >10) and the factors of LB due to high correlation coefficient.

Table1. Descriptive statistics and Pearson correlations for student-athletes (N = 352).

Variable	M	SD	Ske./Kur.	1	2	3	4	5	6	7	8	9	10	11
(1) K & U	12.85	1.68	–.70/1.24	-										
(2) SE & C	11.55	1.93	–.55/1.01	.54**	-									
(3) SS & S	11.63	1.86	–.55/1.20	.53**	.57**	-								
(4) ME	41.12	8.75	–.97/.70	.35**	.30**	.35**	-							
(5) GSE	41.05	8.25	–.92/.47	.34**	.31**	.35**	.93**	-						
(6) TE	42.02	8.59	–1.06/.88	.33**	.29**	.33**	.89**	.90**	-					
(7) CBE	42.63	8.55	–1.14/1.08	.37**	.30**	.35**	.90**	.91**	.91**	-				
(8) TIB	51.25	7.58	–.38/.28	.36**	.29**	.31**	.62**	.58**	.59**	.59**	-			
(9) DB	34.25	5.45	–.06/-.24	.32**	.30**	.29**	.62**	.58**	.55**	.56**	.87**	-		
(10) PFB	18.87	3.44	–.45/.48	.25**	.25**	.23**	.57**	.50**	.49**	.48**	.78**	.77**	-	
(11) AB	15.65	4.08	.41/.30	.03	.14**	.16**	.04	.08	.02	–.01	.26**	.35**	.26**	-
(12) SSB	29.35	5.03	.37/.61	.27**	.28**	.25**	.60**	.56**	.53**	.53**	.81**	.83**	.80**	.39**

Ske.=skewness; Kur.= Kurtosis; K & U=Knowledge and understanding; SE & C=Self-expression and communication with others; SS & S=Sense of self and self-confidence; ME=Motivation Efficacy; GSE=Game Strategy Efficacy; TE=Technique Efficacy; CBE=Character Building Efficacy; TIB=Training and Instruction Behaviour; DB=Democratic Behaviour; PFB=Positive Feedback Behaviour; AB=Autocratic Behaviour; SSB= Social Support Behaviour. *$p < 0.05$, ** $p < 0.01$ (two-tailed).

Table 2. HLRs of physical literacy as predictors towards coaching efficacy and leadership behaviour perceived by student-athletes.

Predicting Variables	Coaching Efficacy				Leadership Behaviour				
	ME	GSE	TE	CBE	TIB	DB	PFB	AB	SSB
Gender	–0.09	–0.08	–0.07	–0.07	–0.05	–.05	–.06	–0.21	–0.06
Age	0.01	0.06	0.03	0.08	–.13*	–.15**	–.08	–.29	–0.10#
Training experience	–0.02	–0.06	0.00	–0.02	.01	.05	.01	.13	.08
R²	0.03	0.04	0.02	0.03	.02	.03	.02	.12	.02
F	3.30	3.98	2.67	3.39	2.75	2.82	1.90	15.33	2.03
K & U	.22**	.18**	.19**	.23**	.27**	.22**	.15*	–.09	.15*
SE & C	.07	.10	.07	.06	.09	.12#	.12^{+}	.09	.14*
SS & S	.17*	.19**	.17*	.18**	.10	.09	.07	.12#	.08
R²	.17	.18	.15	.18	.17	.16	.09	.14	.11
***R²* change**	.14	.15	.13	.15	.15	.13	.08	.02	.09
***F* change**	19.07	19.51	17.04	20.51	19.77	16.89	9.43	2.61	11.66

# $p < 0.10$, * $p < 0.05$, ** $p < 0.01$. K & U=Knowledge and Understanding; SE & C=Self-expression and Communication with others; SS & S=Sense of self and Self-confidence; ME=Motivation Efficacy; GSE=Game Strategy Efficacy; TE=Technique Efficacy; CBE= Character Building Efficacy; TIB=Training and Instruction Behaviour; DB=Democratic Behaviour; PFB=Positive Feedback Behaviour; AB=Autocratic Behaviour; SSB= Social Support Behaviour.

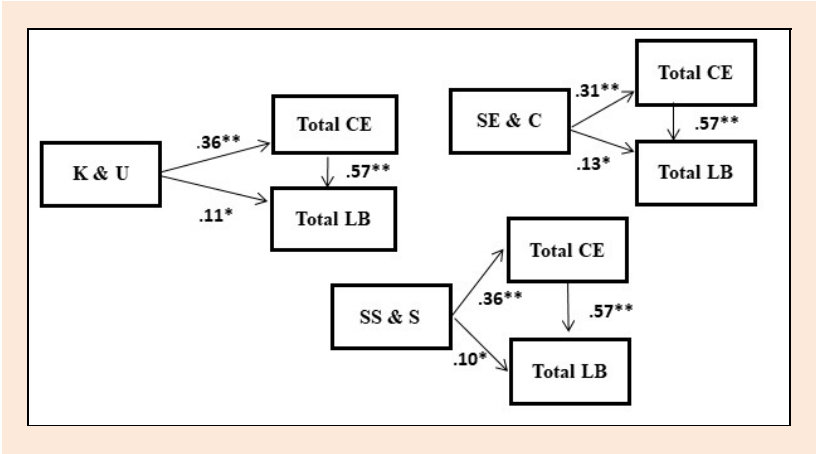

Figure 3. Path analysis results of three attributes of perceived physical literacy with total coaching efficacy and total leadership behaviour respectively. K & U=Knowledge and Understanding; SE & C=Self-expression and Communication with others; SS & S=Sense of self and Self-confidence; CE= Coaching Efficacy; LB= Leadership Behaviour; * $p < 0.05$, ** $p < 0.01$ (two-tail).

A series of hierarchical regressions were performed to examine the prediction of PPL on CE and LB, using each attribute of PPL as predictors by controlling for demographic factors such as age, gender, and training experience. Demographic factors were entered in Step 1, followed by each attribute of PPL. Overall, only age was statistically significant as a predictor of LB. After entering the PPL variables in Step 2, all models were significantly improved, which are summarized in Table 2. According to Pedhazur (1982), obtaining a redundancy index of 10% or above indicated a meaningful outcome.

Specifically, for CE, demographic variables reported only 3% of the variance in student-athletes' perceptions of ME at Step 1. After entering attributes of PPL, the model explained 17% of the variance in ME ($F(6, 330) = 11.46$, $p < 0.0001$). Two significant factors (K&U, SS&S) explained additional 14% of the variance in the ME. These two factors of PPL also explained an additional 15% of the variance in GSE ($F(6, 330) = 10.04$, $p < 0.0001$, $R^2 = 0.18$), 13% in TE ($F(6, 330) = 12.08$, $p < 0.0001$, $R^2 = 0.15$), and 15% in CBE ($F(6, 330) = 12.25$, $p < 0.0001$, $R^2 = 0.18$). By contrast, the PPL attribute of SE&C did not significantly predict CE. The K&U dimension of perceived PL was the strongest predictor of CE, especially in ME ($\beta = 0.22$) and CBE ($\beta = 0.23$).

For LB, demographic variables reported only 2% of the variance in TIB reported by student-athletes at Step 1. After entering variables of PPL, K&U predicted 16% of the total variance in the LB factor of TIB ($F(6, 330) = 11.49$, $p < 0.0001$, $R^2 = 0.17$). K&U of PPL also accounted for an additional 13% of the variance in DB perceived by student-athletes ($F(6, 330) = 10.06$, $p < 0.0001$, $R^2 = 0.16$), 8% in PFB ($F(6, 330) = 5.74$, $p < 0.0001$, $R^2 = 0.09$), and 9% in student-athletes' perceptions of SSB ($F(6, 330) = 6.94$, $p < 0.0001$, $R^2 = 0.11$). SE&C showed a significant prediction of variance with SSB ($\beta = 0.14$). K&U explained most of the significance in LB, especially TIB ($\beta = 0.27$) and DB ($\beta = 0.23$).

Path analysis was performed to examine the direct or indirect influence of PPL on LB, using CE as a mediating factor. To avoid multicollinearity effects, path analysis was conducted between each attribute of PPL and total CE, and total LB respectively. Figure 3 presents the results of predicted variance between each attribute of PPL and LB, mediated by CE. Univariate linear regression was first performed between PPL and CE, with each attribute as independent variable and, total CE as the dependent variable. In this step, K&U accounted for 36% of the variance in predicting total CE, SE&C was 31%, while SS&S accounted for 36% of the variance for total CE. The predict-

ing variances were then documented using PPL as independent variable, LB as dependent variable. After adding total CE into the independent variable of three models, the variance of K&U reduced from $\beta = 0.31$ to $\beta = 0.11$, the variance of SE&C dropped from $\beta = 0.31$ to $\beta = 0.13$, and the variance of SS&S reduced from $\beta = 0.31$ to $\beta = 0.10$. Total CE accounted for 57% of the total variance in predicting total LB perceived by student-athletes.

Discussion

The purpose of the present study was to explore the possible influence of PPL on coaching from the perceptions of student-athletes. This study was the first to explore the possible influence of PPL in the coaching context by examining the relationship between student-athletes' PPL with their perceptions of CE and LB. Results indicate that PPL is a significant predictor of CE and LB, and student-athletes' perceptions of CE is a significant mediating factor in the prediction from PPL to LB. For the prediction from PPL to CE, results revealed student-athletes who are physically literate (e.g., motivated and competent to participate in structured physical activities) are highly capable of sensing their coaches' confidence in coaching. These relationships closely resemble self-efficacy theory which posits that psychological and physiological states combine together to generate efficacy beliefs (Bandura, 1997). Apart from an individual's physical state, the ability of mentally perceiving personal traits, beliefs, and purposes and their confidence in expressing feelings can influence efficacy expectations. Corbin (2016) also argued that confidence (including self-efficacy) may be transient at one point and may vary at another. The attributes of PPL has such trait-like components that may vary from situation to situation (Feltz and Oncu, 2014). For example, the PPL attribute of SE&C may be transient to predict more coaches' GSE through regular training rather than in competitions. One possible reason is that when an individual moves freely and confidently in sport, he/she is more likely to generate more efficacies or confidence in expressing the movement (Feltz et al., 1999; Myers et al., 2005; Sum et al., 2016). For the other PPL attributes, no significance was found. The tendency of student-athletes to overexpress themselves during coaching should be considered, especially when coaches must adopt an autocratic leadership style (Myers et al., 2005).

Student-athletes' PPL also significantly predicted their perceptions of coaches' LB. Findings of the present study echo Horn's (2002) working model of coaching effectiveness, which highlights personal characteristics as predictors of coaches' behavior. As a disposition showing active attitude for life, PPL can be regarded as one of the characteristics to influence leaders' behavior. The PPL attribute of K&U showed the strongest contributions to perceptions of LB, especially in TIB and DB. These findings suggest that PPL has the potential for improving student-athletes' perceptions of coaches' instructional training and decision-making (democratic) behaviors. As Castelli et al. (2014) suggested, PL enables an individual to actualize his/her inherent potential of embracing active or healthy living, regardless of initial skill set or fitness level. Whitehead (2010) also commented that the attributes of PL are dynamic and interpretive to demonstrate an active attitude to the environment. Student-athletes are likely to easily understand and follow their coaches' instructions when a higher level of PPL was prevalent in a specific sport context. Myers et al. (2005) suggests that this attribute allows athletes to more easily address problems without resorting to alternatives. A recent longitudinal study examined how individual characteristics at within-personal level influence how athletes perceive external events (Stenling et al., 2017). Findings of the present study revealed that there was little association between the attributes of PPL and student-athletes' perceptions of AB. Chelladurai (1990) regards this type of behavior as authority and independent, which suggests that it is coaching behavior where the coach makes autocratic decisions. The autocracy belonging to coaches' behaviors may have little connection with the student-athletes' PPL.

Findings of the study provide evidence of the direct path from each dimension of student-athletes' PPL to their perceptions of LB. It is notable that student-athletes' PPL directly influences their perceptions of coaches' leadership style of behavior and indirectly mediated through their perceptions of CE. As a disposition that establishes purposeful embodied dimensions for active lifestyle, PPL could be regarded as one type of an individual's personal characteristics. Thus, this finding aligns with the working model of coaching effectiveness (Horn, 2002), which highlights CE as a mediating factor for the influence from personal characteristics to the effectiveness of the coaching reflected by LB. Meanwhile, these findings are also consistent with research examining the influence of other predictors (e.g. emotional intelligence, quotient, and self-efficacy) to coaching effectiveness reflected by LB (Hwang et al., 2013; Saville and Bray, 2016; Zhang, 2015). The mediation effect of CE was larger than the direct effect, suggesting the main path from student-athletes' PPL to their perceptions of LB was through perception of their coaches' efficacy in the different domains.

According to Horn's (2002) working model of coaching effectiveness, student-athletes' CE and LB could directly reflect coaches' effective coaching (Myers et al., 2006a; 2006b). In regards to the reciprocal relationship between student-athletes and their coaches, the findings of this study confirmed the positive strength of PPL in influencing coaches' effectiveness. In this case, the findings from the current study provide a new perspective for further coach-oriented interventions or coaches' continuing professional development (Sullivan et al., 2010; Sum et al., 2018b). For example, if coaches develop their understanding of PPL, it is likely they would become more efficacious in manifesting leadership behavior that fosters PPL in their student-athletes, which is likely to lead to greater coaching effectiveness.

Although a valuable addition to the extant literature on student-athletes' PPL and the coaching context the study is not without its limitations. First, although PPLI is credited as reliable measurement for assessing PPL, the instrument did not include the attribute of perceived compe-

tency, which is a potential key attribute for developing PPL. While CE includes the confidence in delivering coaching techniques and instructions, the exclusion of this attribute in the present instrument could only provide perspectives from PPL underpinning active attitudes and living. Subsequent instruments should consider the comprehensive nature of this concept. Second, the study found a possible contribution from PPL to coaching effectiveness based on Horn's (2002) working model by including CE and LB as main variables. However, no actual outcomes of coaching effectiveness (e.g. win-loss percentage or actual coach behavior) were considered in the analysis. Coaching effectiveness was only inferred from the perceived perspective. Further studies should consider including coaching behavior and performance, student-athletes' perceived motivational climate and satisfaction as the practical studies of PL. In addition, coaches' view of PPL should also be considered in accordance with Horn's (2002) model. The present study was situated solely from student-athletes' perspective, some triangulations with coaches' perspectives might validate the findings.

Conclusion

This study was the first to examine the influence of student-athletes' perceived PL on their perceptions of coaching effectiveness. The findings of this study highlighted the importance of secondary aged student-athletes' PPL in predicting CE and LB, which were the main reflective domains of the effectiveness of coaching. Considering the important role of student-athletes' PL played in coaching activities, more attention should be paid to develop athletes' PL, including delivering the knowledge of PL concept, emphasizing athletes' sense of self and self-confidence, and self-expression and communication with their coaches or others during coaching practice. In addition, the current study could provide a brand new perspective for the future coaching interventions, especially for coaches who participated in continuing professional programs, they should focus more on developing student-athletes' PL to achieve effective coaching. Moreover, as the main stakeholders of athletes during coaching, coaches should combine coaching with the concept of PL or embed PL concept into their coaching practice.

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References

Bandura, A. (1997) *Self-efficacy: The exercise of control*. New York: Freeman.

Bennett, D. A. (2001) How can I deal with missing data in my study? *Australian and New Zealand Journal of Public Health* **25,** 464-469.

Boardley, I. D., Kavussanu, M. and Ring, C. M. (2008) Athletes' perceptions of coaching effectiveness and athlete-related outcomes in rugby union: an investigation based on the coaching efficacy model. *Sport Psychologist* **22,** 269-287.

Castelli, D., Centeio, E., Beighle, A., Carson, R. and Nicksic, H. (2014) Physical literacy and comprehensive school physical activity programs. *Preventive Medicine* **66,** 95-100.

Chase, M. A., Feltz, D. L., Hayashi, S. W. and Hepler, T. J. (2005) Sources of coaching efficacy: the coaches' perspective. *International Journal of Sport and Exercise Psychology* **3,** 27-40.

Chelladurai, P. (1984) Discrepancy between preferences and perceptions of leadership behavior and satisfaction of athletes in varying sports. *Journal of Sport Psychology* **6,** 27-41.

Chelladurai, P. (1990) Leadership in sports: a review. *International journal of sport psychology* 21**,** 328-354.

Chelladurai, P. (1999) *Human resource management in sport and recreation*, Human Kinetics.

Chelladurai, P. and Saleh, S. D. (1980) Dimensions of leader behavior in sports: development of a leadership scale. *Journal of sport psychology* **2,** 34-45.

Chen, Z. Q. (2004) *Research on coaching efficacy, social support and physical and mental fatigue.* Master thesis, National Sport University, Taoyuen.

Cheng, C. F. (1997) Research orientation of sports coach leadership behavior. *Chinese sports quarterly* **11,** 22-31.

Corbin, C. B. (2016) Implications of physical literacy for research and practice: a commentary. *Research Quarterly for Exercise and Sport* **87,** 14-27.

Delaney, B. and Donnelly, P. (2008) *Improving physical literacy*. Belfast: Sport Northern Ireland.

Feltz, D.L., Chase, M. A., Moritz, S. E. and Sullivan, P. J. (1999) A conceptual model of coaching efficacy: preliminary investigation and instrument development. *Journal of Educational Psychology* **91,** 765-776.

Feltz, D.L. and Oncu, E. (2014) *Self-confidence and self-efficacy,* New York, NY, Routledge.

Feltz, D.L, Short, S. E. and Sullivan, P. J. (2008) *Self-efficacy in sport,* Champaign, IL, Human Kinetics.

Flemons, M. (2013) The reconceptualisation of gymnastics: equipping physical education teachers to promote physical literacy in schools. *International Council of Sport Science & Physical Education (ICSSPE) Bulletin, Journal of Sport Science and Physical Education* **65,** 189-198.

Gallant, P., Vossen, D. P. and Weaving, C. (2011) In the zone: physical literacy and the quest for certified coaches. *Physical & Health Education Journal* **77,** 16-21.

Garland, D. J. and Barry, J. R. (1988) The effects of personality and perceived leader behaviors on performance in collegiate football. *The Psychological Record* **38,** 237-247.

Giblin, S., Collins, D. and Button, C. (2014) Physical literacy: importance, assessment and future directions. *Sports Medicine* **44,** 1177-1184.

Gravetter, F. and Wallnau, L. (2014). *Essentials of statistics for the behavioral sciences (8th ed.),* Belmont, CA, Wadsworth.

Haughey, T., Breslin, G., Toole, S. and Mckee, M. (2013) Developing physical literacy through coach education: a Northern Ireland perspective. *Journal of Sport Science and Physical Education* **65,** 253-257.

Horn, T. S. (2002) *Coaching effectiveness in the sport domain.,* Champaign:IL, Huamn Kinetics.

Hwang, S., Feltz, D. L. and Lee, J. D. (2013) Emotional intelligence in coaching: mediation effect of coaching efficacy on the relationship between emotional intelligence and leadership style. *International Journal of Sport and Exercise Psychology* **1,** 1-15.

Kavussanu, M., Boardley, I. D., Jutkiewicz, N., Vincent, S. and Ring, C. M. (2008) Coaching efficacy and coaching effectiveness: examining their predictors and comparing coaches' and athletes' reports. *The Sport Psychologist* **22,** 383-404.

Kenow, L. J., & Williams, J. M. (1992). Relationship between anxiety, self-confidence, and evaluation of coaching behaviors. *The Sport Psychologist* **6(4),** 344-357.

Kwon, H. H., Koh, K. T., Pyun, D. Y. and Wang, J. (2009) Psychometric properties of leadership scale for sport: the case of Singaporean secondary school athletes. *International Journal of Sport Management* **10,** 367-381.

Longmuir, P. E. and Tremblay, M. S. (2016). Top 10 research questions related to physical literacy. *Research Quarterly for Exercise and Sport* **87,** 28-35.

Mandigo, J., Francis, N. and Lodewyk, K. (2007) Physical literacy concept paper. *Canadian Sport for Life*. Available from URL: http://excelsiorgroup.co.uk/wp-content/uploads/2015/03/Physical-Literacy-Concept-Paper-

1.pdf
Myers, N. D., Feltz, D. L., Maier, K. S., Wolfe, E. W. and Reckase, M. D. (2006a) Athletes' evaluations of their head coach's coaching competency. *Research Quarterly for Exercise and Sport* **77,** 111-121.
Myers, N. D., Vargas-Tonsing, T. M. and Feltz, D. L. (2005). Coaching efficacy in intercollegiate coaches: Sources, coaching behavior, and team variables. *Psychology of Sport and Exercise* **6,** 129-143.
Myers, N. D., Wolfe, E. W., Maier, K. S., Feltz, D. L. and Reckase, M. D. (2006b) Extending validity evidence for multidimensional measures of coaching competency. *Research Quarterly for Exercise and Sport* **77,** 451-463.
Nunnally, J. (1978) *Psychometric Theory,* New York: McGraw-Hill.
Pedhazur, E. J. (1982) *Multiple regression and behavioral research,* New York, Holt, Rinehart&Winston.
Pyun, D. Y., Kwon, H. H., Koh, K. T. and Wang, C. K. J. (2010) Perceived coaching leadership of youth athletes in singapore. *Journal of Sport Behavior* **33,** 25-41.
Roetert, E. P. and Macdonald, L. C. (2015) Unpacking the physical literacy concept for K-12 physical education: what should we expect the learner to master? *Journal of Sport and Health Science* **4,** 108-112.
Saville, P. D. and Bray, S. R. (2016) Athletes' perceptions of coaching behavior, Relation-Inferred Self-Efficacy (RISE), and self-efficacy in youth sport. *Journal of Applied Sport Psychology* 28**,** 1-13.
Spengler, J. (2014) Physical literacy global environmental scan. *Aspen Institute paper.* Available from URL: https://www.shapeamerica.org/uploads/pdfs/GlobalScan_FINAL.pdf
Stenling, A., Ivarsson, A., Hassm N, P. and LindwallI, M. (2017) Longitudinal associations between athletes' controlled motivation, ill-being, and perceptions of controlling coach behaviors: A Bayesian latent growth curve approach. *Psychology of Sport and Exercise* **30,** 205-214.
Sullivan, G, C. J. and Feltz, D. L. (2006) Playing experience: The content knowledge source of coaching efficacy beliefs. *Trends in Educational Psychology* 185-194.
Sullivan & Kent, A. (2003) Coaching efficacy as a predictor of leadership style in intercollegiate athletics. *Journal of Applied Sport Psychology* **15,** 1-11.
Sullivan, P, K., Holt, N. L. and Bloom, G. (2012) The relation of coaching context and coach education to coaching efficacy and perceived leadership behaviors in youth sport. *Sport Psychologist* **26,** 122-134.
Sullivan, Whitaker-Campell and Mackay (2010) Physical literacy in coaching educational materials: a case study of canada basketball. *Physical & Health Education Journal* **76,** 32-35.
Sum, R. K. W., Cheng, C. F., Kuo, C. C., Wang, F. J. and Choi, S. M. (2018a) Perceived physical literacy instrument for adolescents: a further validation of the PPLI. *Journal of Exercise Science and Fitness* **16,** 26-31.
Sum, R. K. W., Ha, A. S., Cheng, C. F., Chung, P. K., Yiu, K. T., Kuo, C. C., Yu, C. K. and Wang, F. J. (2016) Construction and validation of a perceived physical literacy instrument for physical education teachers. *PLoS One* **11,** e0155610.
Sum, R. K. W., Wallhead, T., Ha, S. C. A. & Sit, H. P. C. (2018b) Effects of physical education continuing professional development on teachers' physical literacy and self-efficacy and students' learning outcomes. *International Journal of Educational Research* **88,** 1-8.
Surujlal, J. & Dhurup, M. (2012) Athlete preference of coach's leadership style. *African Journal for Physical, Health Education, Recreation and Dance (AJPHERD)* **18,** 111-121.
Whitehead, M. (2010) *Physical Literacy Throughout the Lifecourse.,* London, Routledge Taylor & Francis Group.
Whitehead, M. (2001) The concept of physical literacy. *European Journal of Physical Education* **6,** 127-138.
Whitehead, M. (2016) International Physical Literacy Association. Available from URL: http://www.physical-literacy.org.uk/. the UK.
Zhang, Y. M. (2015) Emotional quotient and sport coaches' leadership behavior: the intermediary effect of coaching efficacy. *Journal of Chengdu Sport University* **41,** 90-95.

Key points

- This study is the first to examine the influence of student-athletes' perceived PL on their perceptions of coaching effectiveness Results have shown that perceived physical literacy has significant influence on predicting coaching effectiveness from student-athletes' perceptions
- The current study provides a fresh perspective for the ongoing PL and coaching education programs in practice.
- Coach education programs should focus on the development of student-athletes' PL to focus on the prolonged motivation to engage in sport and physical activity over the longer term.

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