

1      **Impacts of Talent Development Environments on Athlete Burnout: A Self-**  
2                               **Determination Perspective**

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**1 Abstract**

2 Guided by Deci and Ryan's (2000) self-determination theory, this survey study  
3 aimed to examine the effects of the talent development environmental factors on  
4 athlete burnout. Talented adolescent athletes ( $N = 691$ ) filled out a survey form  
5 measuring the talent development environmental factors, needs satisfaction, and  
6 burnout. The findings showed that three talent environmental factors (i.e., long-term  
7 development focus, holistic quality preparation, and communication) were negative  
8 predictors of burnout via needs satisfaction. It was concluded that the three talent  
9 development environmental factors may be important for facilitating athletes' needs  
10 satisfaction and preventing burnout.

11

1           **Impact of Talent Development Environment on Athlete Burnout: A Self-**  
2   **Determination Perspective**

3 To achieve sporting excellence, many sports organisations or associations have  
4 invested considerable resources or efforts to develop athletic talents (Baker &  
5 Schorer, 2010; Collins & MacNamara, 2012). Talent development is about providing  
6 the most conducive learning environment to realize athletes' potential in sports  
7 (Williams & Reilly, 2000). It is a long-term journey for athletes to develop  
8 themselves into an excellent performer (Ericsson, 2007). Talented athletes are  
9 required to combat numerous challenges such as injury, repetitive training, and  
10 parental pressure alongside this long-term journey (Gustafsson, Kenttä, & Hassmén,  
11 2011). Unfortunately, some athletes may fail to meet these challenges and suffer  
12 from burnout. Burnout is a maladaptive psychological syndrome, manifesting as  
13 reduced sense of accomplishment, physical and emotional exhaustion, and sport  
14 devaluation (Raedeke, 1997). Burnout can negatively affect athletes' health and sport  
15 performance (Gustafsson et al., 2011; Schaufeli & Bunnk, 2003). It is therefore  
16 necessary to understand the antecedents of athlete burnout. Recently, several studies  
17 have applied self-determination theory (SDT; Deci & Ryan, 2000) for examining  
18 athlete burnout (Gustafsson, Hancock, & Côté, 2014; Li, Wang, Pyun, 2013).  
19 Drawing on SDT, this research aims to understand how athlete burnout is related to  
20 the social context (i.e., talent development environment).

21           **Talent development environment**

22 The talent development environment refers to the all aspects of the surroundings,  
23 where athletic potentials are realised (Henriksen, Stambulova, & Roessler, 2010;  
24 Martindale, Collins, & Daubney, 2005). It is evident that talent development  
25 environmental factors (e.g., training programme, parents) influence athletes' expert

1 performance (Araújo & Davids, 2011; Henriksen, Larsen, & Christensen, 2014; Li,  
2 Wang, & Pyun, 2014). Talented athletes are required to overcome environmental  
3 constraints or adapt external factors such as setbacks and arduous training  
4 programmes to acquire their sport expertise (Phillips, Davis, Renshaw, & Portus,  
5 2010). This implies a need to identify significant environmental factors for effective  
6 talent development. Several key features of effective and controllable talent  
7 development environment were identified in review studies (for reviews, see Li et al.,  
8 2014; Martindale et al., 2005). In particular, five key and effective environmental  
9 factors have consistently emerged from the talent development literature and are  
10 believed to influence talent development, including long-term development focus  
11 (e.g., ongoing opportunities, de-emphasis of winning), holistic quality preparation  
12 (e.g., clear training guidance, balanced training and life), support network (e.g., sport  
13 science support, coach support), communication (e.g., feedback, rationale for  
14 training), and alignment of expectations (e.g., goal setting and review; Li, Wang,  
15 Pyun, & Martindale, 2015). According to SDT (Ryan & Deci, 2000), the five  
16 environmental factors are hypothesised to influence talented athletes' three basic  
17 psychological needs. However, little empirical evidence is available concerning how  
18 these effective environmental factors are related to the three basic psychological  
19 needs.

## 20 **Environment and basic psychological needs**

21 The three basic psychological needs are autonomy (the experience of self-  
22 endorsement of one's activity), competence (the experience of effective involvement  
23 in an activity), and relatedness (the experience of a sense of connectedness and  
24 mutual respects; Deci & Ryan, 2000). According to SDT (Ryan & Deci, 2000),  
25 positive environmental factors (e.g., parental support and quality coaching

1 programmes) are nutriments for nurturing athletes' basic psychological needs or  
2 needs satisfaction. For example, the characteristics of long-term development focus  
3 are to provide long-term development opportunities, avoid selection pressure, allow  
4 making mistakes, and de-emphasize winning (Li et al., 2015). Under this  
5 environment, athletes' autonomy and competence are believed to be fulfilled as they  
6 are given opportunities to participate in their sports, have their own control on  
7 selection pressure, and are able to understand winning or losing is not that important  
8 during the early stage of development (Deci & Ryan, 2000). Similarly, the other four  
9 talent development environmental factor focus on providing high-quality training  
10 programmes, offering personnel support, providing feedback and rationale for  
11 training, and establishing reasonable goals (Li et al., 2015), and they are also likely  
12 to enhance athletes' needs satisfaction (Deci & Ryan, 2000). Therefore, it is highly  
13 possible that the talent development environmental factors are relevant social  
14 antecedents that can provide nutriments to satisfy athletes' three basic psychological  
15 needs.

### 16 **Basic psychological needs and burnout**

17 There are several studies investigating the relationships between the three basic  
18 psychological needs and athlete burnout (e.g., Hodge, Lonsdale, & Ng, 2008;  
19 Martinent, Decret, Guillet-Descas, & Isoard-Gautheur, 2014). Earlier study findings  
20 generally supported the negative relationships between the three basic psychological  
21 needs and athlete burnout (e.g., Hodge et al., 2008; Martinent et al., 2014). A recent  
22 meta-analytic research showed that needs satisfaction had a moderate to high  
23 association with burnout (Li et al., 2013). These findings are in line with the tenets  
24 of SDT that unfulfilled basic psychological needs will lead to maladaptive  
25 motivational outcomes such as burnout. SDT also maintains that positive social

1 factors will enhance needs satisfaction and lead to positive personal growth such as  
2 enhanced sports performance, whereas failure to provide supportive environments to  
3 satisfy the basic psychological needs will result in physical and psychological ill-  
4 being such as burnout (Deci & Ryan, 2000).

#### 5 **Environment, basic psychological needs, and burnout**

6 Burnout has received increasing attention in the sport literature (Goodger, Gorely,  
7 Lavalley, & Harwood, 2007). A close examination on social environment is  
8 recommended to find out significant factors that potentially contribute to athlete  
9 burnout (Curran, Appleton, Hill, & Hall, 2011). Several significant factors such as  
10 coaching climate (e.g., Isoard-Gauthier, Guillet-Descas, & Duda, 2013; Lemyre,  
11 Hall, & Roberts, 2008), teammate support (e.g., DeFreese & Smith, 2013; Smith,  
12 Gustafsson, & Hassmén, 2010), and parenting style (e.g., Gustafsson, Hill, Stenling,  
13 & Wagnsson, 2015) were found to be associated with burnout. Conceptually, these  
14 identified factors are similar to (but distinct from) the five talent developmental  
15 factors such as support network. To date, it is still unclear on how athlete burnout is  
16 related to the five talent development environmental factors.

17 To explain the relations among environmental factors, needs satisfaction, and  
18 motivational consequences (e.g., burnout), the model of motivation sequence was  
19 developed by Vallerand (1997). In Vallerand's model, needs satisfaction is proposed  
20 to mediate the effects of social factors on motivational consequences (i.e., social  
21 factors → needs satisfaction → motivational consequences). The model of  
22 motivational sequence has been examined in the sport literature (e.g., Alvarez,  
23 Balaguer, Castillo, & Duda, 2012; Jõesaar, Hein, & Hagger, 2011). While the talent  
24 development environment is of importance for developing athletes, its relationship

1 with the development of the three basic psychological needs and prevention of  
2 athlete burnout has not been examined via this model.

3 Past studies have shown that contextual factors exerted indirect effects on  
4 motivational consequences via needs satisfaction (e.g., Alvarez et al., 2012; Sarrazin,  
5 Vallerand, Guillet, Pelletier, & Cury, 2002). Because examining the mediating  
6 effects is meaningful for theoretical building of the psychological process (Preacher  
7 & Hayes, 2008), it is important to investigate how the talent development  
8 environmental factors predict burnout via needs satisfaction.

### 9 **The current study**

10 To bridge the aforementioned literature gaps, this research was to investigate  
11 the relationships among the talent development environment, needs satisfaction, and  
12 burnout. Specifically, we intended to test the proposed mediation model (i.e., talent  
13 development environment → needs satisfaction → burnout). According to the above  
14 literature review, the following hypotheses were proposed: (a) the five talent  
15 development environmental factors are potential predictors of needs satisfaction  
16 (Hypothesis 1), (b) needs satisfaction is negatively related to burnout (Hypothesis 2),  
17 and (c) needs satisfaction fully mediates the relationship between the talent  
18 development environment and burnout (Hypothesis 3).

## 19 **Method**

### 20 **Participants**

21 Participants of this study must be youth talented athletes (13-18 years old) and were  
22 involved in the talent development programmes at the time of data collection. A  
23 sample of 691 talented young athletes (male = 343, female = 348;  $M_{age} = 14.11$ ,  
24  $SD_{age} = 1.04$ ) was recruited from the talent development programmes in Singapore.  
25 There are different organisations available to offer talent development programmes

1 in Singapore. The Youth Sports Academy and some national sports associations are  
2 responsible for selecting and developing youth athletes who are studying in  
3 mainstream schools. The Singapore Sports School is an independent specialised  
4 school to identify and develop student-athletes guided by long-term development  
5 principles. Athletes enrolling in the above organisations do receive high-quality  
6 training and supporting programmes. Other than the aforementioned organisations, a  
7 few mainstream schools are also running their own talent development programmes  
8 (Li et al., 2015).

9         The participants were involved in 25 individual and team sports such as  
10 basketball, golf, judo, netball, shooting, tennis, and track and field. On average, they  
11 were involved in training for 4.76 years and 10.64 hours every week. The majority of  
12 the respondents had competition experiences either at international ( $n = 198$ ; 29%)  
13 or national level ( $n = 374$ , 54%). Only a small number of participants competed at  
14 zonal or inter-school level ( $n = 45$ ; 6%) and the rest participants ( $n = 74$ ; 11%) did  
15 not indicate their highest competition level.

## 16 **Measures**

17 The battery of questionnaires measuring the talent development environmental  
18 factors, needs satisfaction, burnout, and demographic information (e.g., gender, age,  
19 and sports) were used. The reliability and validity of the scales are reported in the  
20 results section.

### 21 *Talent Development Environment Questionnaire-5 (TDEQ-5)*

22 The 25-item TDEQ-5 (Li et al., 2015) was used to measure the key environmental  
23 factors. The scale consisted of five factors: long-term development focus (five items;  
24 e.g., “My coach allows me to learn through making my own mistakes”), holistic  
25 quality preparation (seven items; e.g., “My coach rarely talks to me about my well-



1 being”), support network (four items; e.g., “I can pop in to see my coach or other  
2 support staff whenever I need to”), communication (four items; e.g., “My coach and  
3 I often try to identify what my next big test will be before it happens”), and  
4 alignment of expectations (five items; e.g., “My coaches make time to talk to my  
5 parents about me and what I am trying to achieve”). Reliability and validity of the  
6 TDEQ-5 was supported with the talented youth athletes from Singapore (Li et al.,  
7 2015). A 6-point Likert scale (1 = “*strongly disagree*” and 6 = “*strongly agree*”) was  
8 used for responses.

### 9 ***Basic Needs Satisfaction in Sport Scale (BNSSS)***

10 Athletes’ three basic psychological needs in sport were measured with the 15-item  
11 BNSSS (Ng, Lonsdale, & Hodge, 2011). Exemplar questions for each factor were: (a)  
12 autonomy (“In my sport, I get opportunities to make choices”), (b) competence (“I  
13 can overcome challenges in my sport”), and (c) relatedness (“In my sport, I feel close  
14 to other people”). Each factor comprised five items. Reliability and validity of the  
15 BNSSS were supported (Ng et al., 2011). For measuring item responses, a 7-point  
16 Likert scale (1 = “*not true at all*”; 7 = “*very true*”) was employed. A composite score  
17 of the three subscales (i.e., needs satisfaction) was calculated for further analyses.

### 18 ***Athlete Burnout Questionnaire (ABQ)***

19 To measure athlete burnout, the ABQ was used (Raedeke & Smith, 2001). The ABQ  
20 assessed three burnout symptoms, namely reduced sense of accomplishment (e.g.,  
21 “I’m not achieving much in sport”), emotional and physical exhaustion (e.g., “the  
22 effort I spent in sport would be better spend doing other things”), and sport  
23 devaluation (e.g., “I feel overly tired from my sport participation”). Each factor  
24 consisted of five items. The construct validity and reliability of the ABQ has been  
25 widely supported (e.g., Lonsdale & Hodge, 2011; Raedeke & Smith, 2001). Athletes

1 were asked to respond to the degree of burnout experience over the last one month  
2 through a 5-point Likert scale (1 = “*almost never*”, 5 = “*almost always*”).

### 3 **Procedures**

4 Ethical approval from the principal investigator’s institution was obtained. Informed  
5 written consents from participants and their parents/guardians to participate in the  
6 study were obtained before conducting the survey. The researchers administered the  
7 survey forms to the participants in quiet classrooms and supervised the procedure of  
8 data collection. Participants were encouraged to respond to the surveys honestly and  
9 informed that there were no correct or wrong answers for the survey. They were also  
10 told that they could withdraw from this study at any time without penalty, prejudice,  
11 negative consequences, or disadvantage. The survey took participants approximately  
12 20 minutes to complete.

### 13 **Data analyses**

14 In the preliminary analyses, missing data analysis, univariate and multivariate outlier  
15 cleaning, and univariate normality test were conducted using SPSS 20.0 (see  
16 Tabachnick & Fidell, 2013). Next, descriptive statistics, internal reliability, and  
17 inter-factor correlations of the major variables were computed.

18 To test the hypothesized model depicted in Figure 1, the two-step approach  
19 of structural equation modeling (Anderson & Gerbing, 1988) was adopted with  
20 maximum likelihood estimator in AMOS 21.0 (Arbuckle, 2013). The first step is to  
21 find an acceptable measurement model. Parcels were used for testing the model (see  
22 Little, Cuningham, Shahar, & Widaman, 2002). Each latent construct had three  
23 parcels. For the TDEQ-5, either one, two, or three items from the corresponding  
24 factors were randomly selected to form each parcel by averaging their scores. Three  
25 parcels for the BNSSS were created according to the three measured facets (i.e.,

1 autonomy, competence, and relatedness). Each of the ABQ factors was indexed by  
2 three parcels, and each parcel had one or two items that were randomly selected and  
3 averaged from the corresponding factor. In total, 27 parcels (three parcels per each of  
4 the nine factors) were created as indicators in assessing overall measurement model  
5 fit. Building upon the acceptable measurement model, the second step is to evaluate  
6 the fit of the hypothesized model (Brown, 2006).

7 Multiple fit indices were used as to assess model fit. A value of  $\chi^2/df$  smaller  
8 than 3.0 indicates good model fit to the data (Kline, 2005). Values for Comparative  
9 Fit Index (CFI)  $\geq .90$ , Root Mean Square Error of Approximation (RMSEA)  $\leq .08$ ,  
10 and Standardised Root Mean Square Residual (SRMR)  $\leq .08$  represent a close model  
11 fit (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004). Values for CFI  $\geq .95$ , RMSEA  
12  $\leq .06$ , and SRMR  $\leq .08$  were used as evidence of good fit (Hu & Bentler, 1999;  
13 Marsh et al., 2004). Finally, to test the mediation effects, bias-corrected  
14 bootstrapping methods with 5000 samples were applied (Preacher & Hayes, 2008).

## 15 Results

### 16 Preliminary analyses

17 Expectation-Maximization algorithm was used for data imputation given that the  
18 missing values were very small (i.e., less than 2.0%; Hair, Black, Babin, & Anderson,  
19 2010). There were no outliers in the data set as all standardised items scores were  
20 within the normal range between -3.29 and +3.29. No multivariable outliers were  
21 identified based on the results of Mahalanobis' distance. Further, all items were  
22 univariate normally distributed (skewness = -1.10 to 1.49, kurtosis = -1.15 to 1.53).

23 Table 1 shows the descriptive statistic of the observed variables. Participants  
24 reported moderate (holistic quality preparation, support network, communication,  
25 and alignment of expectations) to high (long-term development focus) scores of the

1 talent development environmental factors and needs satisfaction, as well as moderate  
2 scores of burnout. The used scales had acceptable to good internal reliability ( $\alpha = .76$   
3 to  $.91$ ). The five talent development environmental factors were positively correlated  
4 with the three basic psychological needs and needs satisfaction ( $.15$  to  $.51$ ,  $ps < .01$ ).  
5 The three basic psychological needs and needs satisfaction were negatively  
6 connected with overall burnout and its three factors ( $-.60$  to  $-.16$ ,  $ps < .01$ ).

7

8 \*\*\*\*Table 1 near here\*\*\*\*

9

### 10 **Structural equational modeling**

11 Estimation of the measurement model yielded good model fit to the data,  $\chi^2 (288) =$   
12  $779.61$ ,  $\chi^2/df = 2.78$ , CFI =  $.952$ , SRMR =  $.041$ , RMSEA =  $.050$ , 90% CI  
13  $(.046, .054)$ . Table 1 presents the results of construct reliability and latent factor  
14 correlations. Construct reliability of all factors were supported ( $.79$  to  $.89$ ). Latent  
15 factor correlations ranged between  $-.45$  to  $.82$ , supporting the discriminant validity  
16 among the factors. These results supported the specified overall measurement model.

17 Building upon the valid measurement model, the analysis of the hypothesized  
18 structural model yielded adequate model fit to the data,  $\chi^2 (303) = 878.29$ ,  $\chi^2/df =$   
19  $2.90$ , CFI =  $.943$ , SRMR =  $.058$ , RMSEA =  $.052$ , 90% CI  $(.048, .057)$ . Figure 1  
20 shows the standardised estimates of the model. Long-term development focus ( $\beta$   
21 =  $.28$ ,  $p < .01$ ), holistic quality preparation ( $\beta = .15$ ,  $p < .01$ ), and communication ( $\beta$   
22 =  $.22$ ,  $p = .02$ ) were significant predictors of needs satisfaction. The path estimates  
23 between support network/alignment of expectations and needs satisfaction were not  
24 significant ( $\beta = .06/.11$ ,  $p = .42/.24$ ). Thus, Hypothesis 1 was partially supported. In  
25 line with SDT and Hypothesis 2, needs satisfaction was negatively related to the

1 three burnout factors ( $\beta = -.70$  to  $-.35$ ,  $ps < .01$ ). The talent development  
2 environmental factors explained 44% variance for needs satisfaction. The talent  
3 development environmental factors and needs satisfaction accounted for 48%, 12%,  
4 22% of the variance in reduced sense of accomplishment, emotional and physical  
5 exhaustion, and sport devaluation, respectively.

6 The additional investigation on the moderating effects of gender on the  
7 hypothesized model was also conducted in this study. The results showed no gender  
8 differences (detailed results are available from the first author upon request). The  
9 moderating effect of age group on the model was not examined due to the small age  
10 range of our participants (i.e., 13 to 18 years).

11

12 \*\*\*\*\*Figure 1 near here\*\*\*\*\*

13

#### 14 **Mediation analyses**

15 Table 2 lists the results of mediation analyses with bootstrapping. There were no  
16 direct effects from the five talent development environmental factors on the three  
17 burnout factors. Three out of the five tested mediation paths (indirect effect) were  
18 significant at either .01 or .05 level. Needs satisfaction was a full mediator for the  
19 relationships between long-term development focus/holistic quality  
20 preparation/communication and the three burnout factors (see Table 2). These results  
21 supported Hypothesis 3.

22

23 \*\*\*\*\*Table 2 near here\*\*\*\*\*

24

25

#### **Discussion**

1 Extending the literature, this survey study investigated the relationships among  
2 athletes' perceptions of the five talent development environmental factors, needs  
3 satisfaction, and burnout. The descriptive statistics showed a relatively high score on  
4 long-term development focus ( $M = 4.78$ , out of 6.00) as well as moderate scores on  
5 holistic quality preparation, support network, communication, and alignment of  
6 expectations ( $M = 3.81$  to 4.35, out of 6.00). It seems that the message of long-term  
7 athletic development has been fairly adopted in the local talent development  
8 programmes, and a higher quality of talent development environment may be  
9 reinforced by improving the other four environmental factors.

10 Three hypotheses were formulated to test the proposed model predicting the  
11 relationships among the talent development environmental factors, needs satisfaction  
12 and burnout. The structural model showed adequate fit to the data, and Hypothesis 1  
13 was partially supported. The paths between the three environmental factors (i.e.,  
14 long-term development focus, holistic quality preparation, and communication) and  
15 needs satisfaction were significant. According to the literature (Martindale et al.,  
16 2010), the characteristics of these three environmental factors focus on de-  
17 emphasizing on winning, offering high quality training programmes, and providing  
18 timely feedback and reviews on the talent development programmes. In other words,  
19 athletes who are trained in effective talent development environments are given  
20 choices in decision making, provided with meaningful rationale for long-term  
21 athletic development, and endowed with development of competence through  
22 holistic training programmes. Hence, athletes' autonomy and competence are built  
23 through these three effective environmental factors.

24 Unexpectedly, however, support network (mainly concerning sport scientists'  
25 professional support to athletes) failed to predict needs satisfaction in the structural

1 model and the strength for the path estimate was negligible ( $\beta = .06$ ). This finding  
2 can be due to the nature of the local social setting. In Singapore, very few sports  
3 teams have full time sport scientists and athletes are not able to see them on a daily  
4 basis. Therefore, sport scientists are unlikely to build close relationships with  
5 athletes. Participants' relatedness may not be satisfied through the sport science  
6 support (Deci & Ryan, 2000). The item contents in support network of the TDEQ-5  
7 may also contribute to the non-significant path. It is expected that athletes could feel  
8 more connected with and valued by family members rather than sport scientists. A  
9 recent study showed that both parental and coach support were associated with  
10 athletes' needs satisfaction, and the effect was greater within the parental relational  
11 context than within the coaching one (Felton & Jowett; 2013). Most of the items in  
12 support network described sport science support rather than parental or coach  
13 support so that support network had no significant association with athletes' needs  
14 satisfaction. On the other hand, there may be a connection between support network  
15 and needs satisfaction under other social contexts, where athletes had more contacts  
16 with support staff.

17 While alignment of expectations was supposed to be an antecedent of needs  
18 satisfaction in Hypothesis 1, the result showed a non-significant relationship ( $\beta$   
19 = .11). In the effective talent development environment, alignment of expectations  
20 was characterized as adjusting goals for sport development while taking athletes' and  
21 parents' perspectives (Li et al., 2015). To this end, athletes are allowed to be  
22 involved in setting reasonable goals, which subsequently enhance their autonomy  
23 and competence. However, the items within alignment of expectations were not  
24 specifically devised to assess athletes' perceptions of motivational climate or goal  
25 orientation cues emphasised by their coaches and/or parents. Past research indicated

1 that there were positive relationships between task-involving climates and needs  
2 satisfaction (e.g., Balaguer et al., 2012; Duda & Hall, 2001). On the contrary,  
3 evidence showed that needs satisfaction had associations with task-involving  
4 climates but no or weak relation to ego-involving climates (e.g., Balaguer et al., 2012;  
5 Reinboth & Duda, 2006). Therefore, it is deemed that the nature of the item wording  
6 within alignment of expectations may contribute to the non-significant path.

7         The non-significant paths between support network/alignment of  
8 expectations and needs satisfaction should not be interpreted as the two  
9 environmental factors were not effective nor important for talent development.  
10 Instead, the current findings provided evidence that the two environmental factors  
11 measured by the TDEQ-5 were not motivational antecedents of needs satisfaction  
12 under the theoretical framework of SDT. Although the SDT constructs accounted for  
13 relatively large variance of athlete burnout, supporting its practical use in  
14 understanding athlete burnout, it might not fully explain this psychological symptom.  
15 Thus, it might be useful to incorporate other theoretical frameworks (e.g., cognitive-  
16 affective model; Smith, 1986) with SDT to help researchers better understand athlete  
17 burnout. For example, according to the cognitive-affective model (1986), burnout  
18 was viewed as a response to stress. The five talent development environmental  
19 factors are likely to be cognitively appraised as the aversive sources of stress when  
20 athletes' needs satisfaction is enhanced within the talent development context (i.e.,  
21 talent development environment → needs satisfaction → stress → burnout).  
22 Meanwhile, the two environmental factors may become critical predictors under  
23 other theoretical frameworks.

24         Hypothesis 2 was confirmed in the current study. Specifically, needs  
25 satisfaction was negatively related to the three burnout factors, which is consistent



1 with the previous meta-analytic results (Li et al., 2013) and SDT (Deci & Ryan,  
2 2000). In line with Hypothesis 3, the results of the mediation analyses indicated that  
3 the relationships between the three environmental factors (i.e., long-term  
4 development focus, holistic quality preparation, and communication) and the three  
5 burnout factors were full mediated by needs satisfaction. These findings provide  
6 initial evidence of the underlying mechanism for the effects of the three  
7 environmental factors on athlete burnout via needs satisfaction. In addition, the three  
8 talent development environmental factors together with needs satisfaction account  
9 for a moderate to large variance in the three burnout factors (12% to 48%; Cohen,  
10 1988). The large explained variance implies that the talent development  
11 environmental factors are important correlates of burnout within the lens of SDT.

## 12 **Limitations and implications**

13         Several limitations and implications pertaining to the current research are  
14 discussed in this section. First, the proposed research questions were examined using  
15 cross-sectional quantitative approach so that the causal conclusions should be drawn  
16 with caution. Alternatively, a longitudinal or experimental study can be used to test  
17 the research questions. Second, it is suggested that needs thwarting should be  
18 included and tested in the model given needs satisfaction and needs thwarting are  
19 two different concepts (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani,  
20 2011; Vansteenkiste & Ryan, 2013). Put simply, whereas low needs satisfaction will  
21 result in functional costs over the time, the undermining process will be accelerated  
22 when needs are thwarted. Finally, the findings from this research identified three key  
23 environmental factors that can be used by practitioners who are involved with talent  
24 development programmes to nurture needs satisfaction and avoid athlete burnout.  
25 For example, coaches are encouraged to implement a long-term developmental

1 programme (e.g., letting athletes understand the rationale of long-term development  
2 and diluting the importance of winning), provide high-quality and holistic training  
3 (e.g., giving a reasonable training load and showing cares to athletes), and open a  
4 door for the coach-athlete communication (e.g., giving formative feedback and  
5 making two-way communication easy). Parents should also encourage children when  
6 they confront with problems, communicate with coaches about their children's  
7 involvement in sports, and support their children's competitions.

### 8 **Conclusions**

9 Support network and alignment of expectations are not significant predictors of  
10 needs satisfaction. The three talent development environmental factors (i.e., long-  
11 term development focus, holistic quality preparation, and communication) positively  
12 predict athletes' needs satisfaction. Moreover, SDT is identified as a useful  
13 theoretical framework in conceptualizing the role of talent development environment  
14 on needs satisfaction and understanding athlete burnout. The current research sheds  
15 light on how to better prepare talented adolescent athletes to elite levels by  
16 facilitating their needs satisfaction and preventing burnout through providing the  
17 effective talent development environmental antecedents.

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