



# The relationship between self-concept clarity, athletic identity, athlete engagement and the mediating roles of quality of life and smartphone use in Chinese youth athletes

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## ABSTRACT

**Background:** Youth athletes represent the future of competitive sports, so examining their commitment to sport is critical. This study investigated the impacts of self-concept clarity and athletic identity on athlete engagement among Chinese youth athletes, and the mediating roles of quality of life and smartphone use.

**Methods:** 410 youth athletes from sports schools completed an online cross-sectional survey measuring self-concept clarity, athletic identity, quality of life, smartphone use, and athlete engagement. We used convenience sampling. Instruments included validated scales like the Self-Concept Clarity Scale.

**Results:** The direct effect of self-concept clarity and athlete engagement in youth athletes was not significant ( $\beta = 0.04$ ,  $p = 0.344$ ), but there was a direct effect of athletic identity and athlete engagement ( $\beta = 0.61$ ,  $p < 0.05$ ). Quality of life mediated the relationships between self-concept clarity (indirect effect =  $-0.054$ , 95 % CI =  $-0.114$ ,  $-0.019$ ), athletic identity (indirect effect =  $0.202$ , 95 % CI =  $0.114$ ,  $0.349$ ) and athlete engagement.

**Conclusions:** This study helps address gaps in understanding athlete engagement in youth athletes. The mediation model provides insights to improve self-concept clarity, athletic identity and quality of life to motivate greater engagement in youth athletes.

## 1. Introduction

Youth athletes constitute the cornerstone of a nation's competitive sports development, and their positive and healthy development is pivotal for the long-term prosperity of the country [1]. Current research on youth athletes has predominantly focused on injury prevention, treatment, and professionalisation [2,3], primarily within the 'athlete' identity framework. However, there has been relatively less exploration of self-concept clarity and athletic identity in this context, thereby neglecting the developmental processes experienced by youth athletes. A clear and positive self-concept can empower youth athletes to understand themselves better and unlock their potential. Joinson [4] research shows that individuals with an explicit self-concept tend to show more robust social

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adaptability and play a crucial role in improving maladaptive behaviours. Self-concept clarity enables youth athletes to evaluate their strengths and weaknesses objectively. This self-awareness and self-understanding are beneficial for their psychological growth. Moreover, a robust athletic identity gives meaning and purpose to youth athletes, motivating them to commit to intensive training regimes and aspire to higher sporting goals [5,6]. By internalising the role of an athlete as part of their self-identity, youth athletes can channel their energy towards athletic excellence. This research explores how self-concept clarity and athletic identity influence youth athletes' engagement, a precursor for their holistic development.

To optimise individual and collective strengths in training and competition, elite sports teams necessitate a high level of athlete engagement from every participant [7]. Athlete engagement is characterised by lasting, positive cognitive and emotional experiences [8], expressed in two dimensions: first, at the psychological level, athletes identify with their sport, possess a belief in their competence, and derive positive and joyful emotional experiences, fostering a willingness to engage in their sport. Second, at the behavioural level, athletes exhibit a cheerful readiness to participate actively in their chosen sports [9]. According to self-concept theory, individuals with high self-concept clarity and a robust athletic identity are likelier to experience greater athlete engagement [10]. Self-concept clarity enables self-awareness, and athletic identity provides meaning to an athlete, both enhancing athletes' psychological connection to their sport [11]. In addition, self-concept clarity and athletic identity promote self-efficacy in one's athletic skills, further motivating engagement at the behavioural level [12]. Currently, there is a limited exploration of the benefits of self-concept clarity and athletic identity on young athletes' athlete engagement, and this study aims to bridge this knowledge through a survey of Chinese adolescent athletes.

Smartphones have become integral to people's lives, offering a plethora of functionalities for learning and working, such as instant message communication, information retrieval, knowledge acquisition, and sharing, while also including leisure and entertainment functions, such as video games and interpersonal interaction [13]. Although some researchers have confirmed the positive effects of smartphones through empirical studies [14,15], the harmful use of smartphones by adolescents should be of more significant concern [16]. Quality of life is a multidimensional concept reflecting the events of daily life, including physical and mental health and social relationships. Subjective feelings influence it and the standard of living [17]. Wacks & Weinstein [18] showed that excessive smartphone use causes a decline in physical fitness in adolescents. Athletes who spend excessive time on smartphones may experience impaired sleep quality, reduced training time, and weakened athletic identity and self-concept [19]. Additionally, those with lower quality of life tend to have higher anxiety and depression [20] and reduced motivation and participation in sports [21]. Therefore, examining the mediating role of smartphone use and quality of life expands the current understanding of factors influencing athlete engagement. This study aimed to elucidate the mechanisms by which these mediating factors shape the effects of self-concept clarity and athletic identity on youth athlete engagement.

## 2. Literature review

### 2.1. Theoretical basis

#### 2.1.1. Self-validation theory

Self-validation theory serves as a foundational framework for understanding the dynamics of self-concept clarity [22], athletic identity, and athlete engagement in the context of youth athletes. This theory elucidates the intricate interplay among these constructs. At its core, self-validation theory posits that individuals are inherently motivated to enhance their ability to predict and control their reality through two primary mechanisms: Firstly, cognitive aspect: Self-validation plays a pivotal role in developing a stable self-concept and identity. It fosters the clarity and coherence of self-perception, allowing individuals to understand better and define themselves within their athletic pursuits. Secondly, the pragmatic aspect, Self-validation enables individuals to align their self-concept with external perceptions held by others. This alignment with external perceptions contributes to the social validation of one's identity [23]. Importantly, individuals with a more explicit self-concept and a well-defined athletic identity are more inclined to set positive and attainable goals. They are also better equipped to engage in athletic endeavours thoughtfully and systematically. In this regard, self-validation theory offers a unique perspective for examining the intricate processes through which self-concept clarity and athletic identity may stimulate athlete engagement.

#### 2.1.2. Self-determination theory

Self-determination theory provides a comprehensive framework for understanding human motivation and the continuum of self-determination, ranging from extrinsic to intrinsic motivation [24,25]. This theory sheds light on the nature of individual athlete engagement behaviours and their connection to satisfying psychological needs. According to self-determination theory, individuals manifest athlete engagement through access to essential resources. Such engagement positively predicts the satisfaction of psychological needs and fosters the internalisation of extrinsic motivation, thereby enhancing levels of athlete engagement. Moreover, Self-determination theory emphasises the acquisition and development of identity over time, underscoring its critical role in regulating an individual's daily life [26]. Studies such as those by Wilson & Muon [27] have highlighted the link between psychological need satisfaction and the exercise of role identity and beliefs. The findings that psychological need satisfaction is linked to role identity and beliefs support the assertion that self-determination theory offers a valuable theoretical framework for understanding identity in exercise-related contexts. Further evidence supporting the relevance of self-determination theory to athlete engagement can be found in studies such as that by Hodge et al. [9], which demonstrated that need satisfaction significantly and positively predicted athlete engagement. Additionally, Lee-Flynn et al. [28] revealed that higher self-concept clarity was associated with a greater need for psychological needs to be met. In sum, self-determination theory allows for a comprehensive examination of the intricate processes

through which self-concept clarity and athletic identity contribute to athlete engagement.

## 2.2. Hypothesis development

### 2.2.1. Self-concept clarity, athletic identity, and athlete engagement

Self-concept clarity is the degree to which a person has a clear, confident, and consistent sense of who they are [29]. Those with higher self-concept clarity judge more independently of external stimuli [30]. Self-concept clarity reflects the structured characteristics of the self-concept and refers to the clarity and certainty of the individual's perception of self [30]. Research by Campbell & Fehr [30] has revealed that individuals with low self-concept clarity may exhibit vulnerability to external influences and tend to rely more on external stimuli when making decisions due to challenges in extracting self-relevant information. In contrast, individuals with high self-concept clarity tend to display cooperative problem-solving behaviours during conflicts and demonstrate better self-discipline and conflict-management skills [31]. A well-defined self-concept equips individuals with enhanced self-awareness, which, in turn, encourages active engagement in fulfilling pursuits and nurturing positive relationships [32].

Athletic identity is the degree to which a person identifies with the role of an athlete and seeks recognition from others for that role [11]. This identification can manifest in multiple ways, including how others perceive them as athletes, self-identification, the degree to which their athletic identity dominates their self-concept, and emotional reactions arising from their ability or inability to fulfil their role as athletes [11,33–35]. Research by Ahmadabadi et al. [36] has demonstrated that individuals who recognise themselves as athletes tend to exhibit a heightened commitment to sports training and goals, ultimately enhancing their performance.

Athlete engagement is the degree to which an athlete is fully involved and enthusiastic in their sport and committed to their goals and values [8]. Athlete engagement reflects how much an athlete enjoys, values, and invests in sports participation. Athlete engagement is a positive psychological state, and research on athlete engagement can guide sports organisation managers and coaches for effective athlete development, as well as point the way for sports psychologists to intervene in athlete burnout from a facilitative rather than a control perspective [9]. Previous research has identified various influential factors in athlete engagement, including the satisfaction of basic psychological needs [37], sports group cohesion [38], sports self-motivation [37], coach-athlete relationships [39] and team motivational climate [40]. Moreover, studies on learning engagement have demonstrated a significant positive relationship between self-concept clarity and individual engagement [41]. Poux & Fry [40] also found a positive correlation between student-athletes' athletic identity and their engagement in career exploration. In light of this background, we propose the following hypotheses:

**Hypothesis 1.** Self-concept clarity of youth athletes positively correlated with athlete engagement.

**Hypothesis 2.** Athletic identity of youth athletes positively correlated with athlete engagement.

### 2.2.2. The mediating role of quality of life and smartphone use

Youth athletes' self-concept clarity and athletic identity may influence athlete engagement through their impact on Quality of Life. Quality of life refers to an individual's subjective perception of their societal position and how it aligns with their goals, expectations, standards, and concerns [42]. It is a multidimensional concept encompassing general well-being and happiness beyond the absence of health problems or illness [43]. Houston et al. [44] observed that athletes have a higher health-related quality of life than non-athletes. While there is limited research on the relationship between self-concept clarity and quality of life in athletes, studies such as Cicero's [45] review have suggested that self-concept clarity is associated with an improved quality of life. Additionally, research by Martin et al. [46] has demonstrated a positive association between athlete engagement and quality of life, with Atkinson and Martin [47] replicating and extending these findings.

Furthermore, Athletic Identity is a significant source of self-definition and self-esteem for elite athletes [48]. Groff et al. [49] found a positive correlation between athletic identity and quality of life in athletes with cerebral palsy participating in the Cerebral Palsy World Games. Therefore, we propose the following hypotheses:

**Hypothesis 3.** Self-concept clarity of youth athletes positively correlated with quality of life.

**Hypothesis 4.** Quality of life of youth athletes positively correlated with athlete engagement.

**Hypothesis 5.** Athletic identity of youth athletes positively correlated with quality of life.

**Hypothesis 6.** Quality of life mediates the relationship between self-concept clarity and athlete engagement.

**Hypothesis 7.** Quality of life mediates the relationship between athletic identity and athlete engagement.

Youth athletes' self-concept clarity and athletic identity may also predict athlete engagement through smartphone use. Erikson's [50] psychosocial development theory highlights identity exploration as a crucial developmental task during adolescence, and activities such as communication via mobile phones serve as a means to fulfil this task [51]. Research by Israelashvili et al. [52] has shown that self-concept clarity in youth is negatively associated with internet addiction and overuse. Similarly, studies on gaming disorders have suggested that individuals with lower self-concept clarity tend to spend more time playing games [53], indicating a propensity for smartphone overuse. Although research on smartphone use and athlete engagement is limited, numerous studies have explored the relationship between smartphone use and study or work engagement. For example, Van Laethem et al. [54] reported a negative correlation between smartphone use and work engagement, and Muñoz & Antino [55] found that smartphone use negatively influences learning engagement.

It is important to note that research on the use of smartphones by athletes is emerging. Such studies have indicated that smartphone use or social media engagement during sports can disrupt attention mobilisation, impact decision-making, induce mental fatigue, delay sleep, and reduce efficiency [56–59]. DesClouds & Durand-Bush [60] have characterised athletes’ relationships with smartphones as complex, involving negative aspects like stress and distraction and positive aspects like self-regulation and social connection. Although limited, a study by Liu et al. [61] found a significant positive association between professional identity and smartphone addiction in a survey of freshman medical students in China. Therefore, we propose the following hypotheses:

**Hypothesis 8.** Self-concept clarity of youth athletes negatively correlated with smartphone use.

**Hypothesis 9.** Smartphone use by youth athletes negatively correlated with athlete engagement.

**Hypothesis 10.** Athletic identity of youth athletes positively correlated with smartphone use.

**Hypothesis 11.** Smartphone use plays a mediating role in the relationship between self-concept clarity and athlete engagement.

**Hypothesis 12.** Smartphone use plays a mediating role in the relationship between athletic identity and athlete engagement.

According to the literature review, we hypothesised a relationship between self-concept clarity, athletic identity, and athlete engagement in youth athletes. In addition, we hypothesised a mediating effect of quality of life and smartphone use in this relationship (see Fig. 1), and our study extends the exploration of factors influencing athlete engagement.

### 3. Method

#### 3.1. Participants and procedures

We based the survey design on this study’s theoretical framework and research hypotheses. The survey consisted of six sections, each measuring one of the main variables of interest: self-concept clarity, athletic identity, quality of life, smartphone use, athlete engagement, and demographic information. We adapted the survey items from existing scales validated in previous studies. The survey items were translated into Chinese by Q. Wu and Y. Tan, and then back-translated into English by the Q. Ding and G. Sun to ensure language equivalence. The survey items were rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

We used convenience sampling to recruit participants from a professional sports school in Shandong, China, which had established collaboration with Q. Ding and G. Sun for this study. The participants were selected based on the following criteria: (a) they were aged between 13 and 23 years old; (b) they had been training in their sport for at least one year; and (c) they had no physical or mental health problems that would prevent them from completing the survey.

Due to the constraints posed by the COVID-19 pandemic, our data collection was conducted online through Wenjuanxing ([www.wjx.cn](http://www.wjx.cn)). We sent the participants the survey link via their coaches, who also aided with explanations and questions. Participants were invited to participate voluntarily, and the survey was administered anonymously. No incentives or rewards were offered for participation. We gathered 540 total questionnaires during the study period from November 19 to December 20, 2021. We applied rigorous screening criteria to the collected responses to ensure data quality. We omitted questionnaires under 100 s, judging them as inadequate

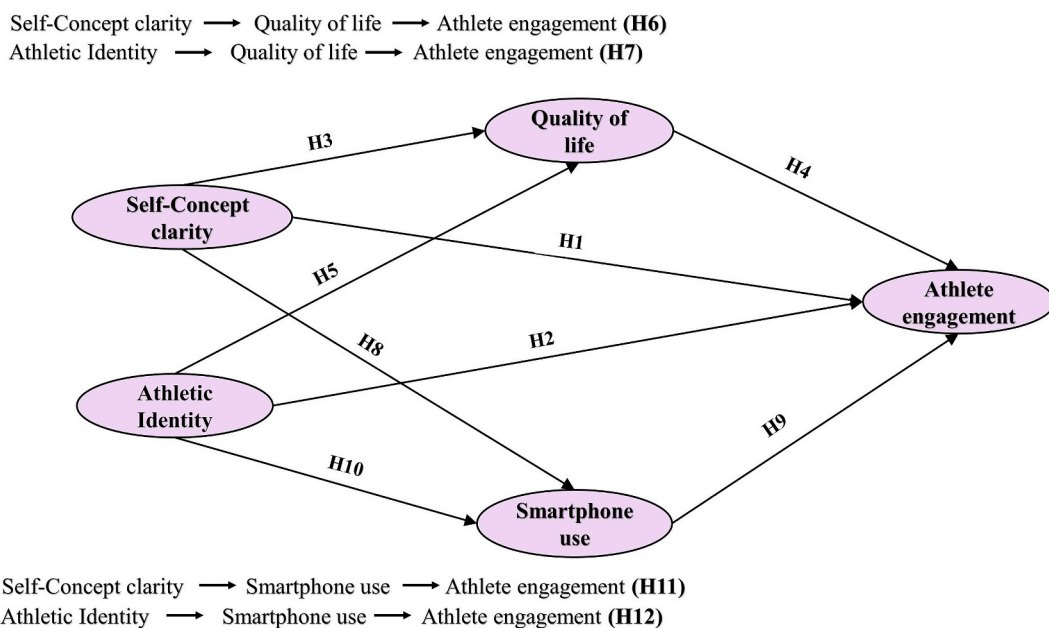


Fig. 1. Conceptual model.

for meaningful data. Additionally, we omitted any questionnaires with incomplete information. Moreover, we considered questionnaires with excessive uniform responses (more than 70 % of the same answers) invalid. We performed these data-cleaning procedures using SPSSAU (<https://spssau.com>).

After applying these screening criteria, 410 valid questionnaires remained, resulting in a final validity rate of 75.93 %. Among these participants, 294 (71.7 %) were male, and 114 (28.3 %) were female. Their ages ranged from 13 to 23 years, with a mean age of 16.66 and a standard deviation (SD) of 1.37. On average, participants had been engaged in sports training for 3.3 years, with an SD of 1.77. Geographically, the participants comprised 194 individuals from urban areas (47.3 %) and 216 from rural areas (52.7 %). Regarding family composition, 96 participants (23.4 %) came from one-child families, while 314 participants (76.6 %) came from non-one-child families (see Table 1).

### 3.2. Measures

#### 3.2.1. Self-concept clarity scale

The self-concept clarity scale, developed by Campbell et al. [62], assessed self-concept clarity. This scale comprises 12 items that gauge an individual's clarity of self-perception (e.g., *It is often hard for me to make up my mind about things because I do not know what I want*) and consistency (e.g., *If I were asked to describe my personality, my description might end up being different from one day to another day*). Higher scores indicate greater self-concept clarity. The Cronbach's  $\alpha$  for this scale in this study was 0.875, exceeding the widely accepted critical value of 0.8 [63], and the Kaiser-Meyer-Olkin (KMO) was 0.895 ( $p < 0.001$ ), surpassing the threshold value of 0.7 [64]. Thus, the scale demonstrated excellent reliability and validity.

#### 3.2.2. Athletic identity scale

The athletic identity scale was developed by Yukhymenko-Lescroart [65]. This scale consists of six items (e.g., *Being a capable athlete*) and is rated on a 5-point Likert scale. The Cronbach's  $\alpha$  for this scale in this study was 0.867, and the KMO was 0.820 ( $p < 0.001$ ), indicating strong reliability and validity.

#### 3.2.3. Athlete engagement scale

The athlete engagement scale used the questionnaire developed by Lonsdale et al. [8]. This scale comprises 16 items organised into four dimensions: confidence (e.g., *I believe I am capable of accomplishing my goals in sport*), Dedication (e.g., *I am determined to achieve my goals in sport*), Vigor (e.g., *I feel energetic when I participate in my sport*), and Enthusiasm (e.g., *I enjoy my sport*). The Cronbach's  $\alpha$  for this scale in this study was 0.963, and the KMO was 0.955 ( $p < 0.001$ ), indicating robust reliability and validity.

#### 3.2.4. Quality of life scale

This study employed the World Health Organization Quality of Life Scale (WHOQOL-BREF) to assess the quality of life of youth athletes. The WHOQOL-BREF is a simplified scale derived from the WHOQOL-100 [66]. WHOQOL-BREF, which comprises 26 items, assesses various domains related to quality of life, including physical (e.g., *Do you have enough energy for everyday life?*), psychological (e.g., *How much do you enjoy life?*), social (e.g., *How satisfied are you with your relationships?*), and environmental (e.g., *How satisfied are you with your transport?*). Given the young age of the participants, one item in the social domain was adapted from Agnihotri et al. [67] to suit the context better: "*Are you satisfied with the respect you receive from others?*". The scale demonstrated a Cronbach's alpha of 0.860 and a KMO of 0.885 ( $p < 0.001$ ), indicating strong reliability and validity.

#### 3.2.5. Smartphone use scale

The smartphone use scale, developed by Kwon et al. [68], serves as the basis for the scale. This scale comprises ten items (e.g., *Missing planned work due to smartphone use*). This scale not only serves to diagnose smartphone addiction but also measures the risk of smartphone addiction [69]. Higher scores reflect greater smartphone use. Cronbach's  $\alpha$  was 0.908, and KMO was 0.907 ( $p < 0.001$ ), attesting to its strong reliability and validity.

**Table 1**  
General participant characteristics by gender.

Variables	Total (n = 410)	Male(n = 294)	Female(n = 116)	T	P-value	
Age(years)	16.66(1.37)	16.77(1.32)	16.37(1.47)	2.685	0.008	
Place of residence, n (%)	Urban	194 ( 47.3 )	130(44.2)	164(55.8)	2.006	0.046
	Rural	216 ( 52.7 )	64(55.2)	52(44.8)		
One-child family or not (%)	Yes	96(23.4)	80(27.2)	214(72.8)	-2.913	0.004
	No	314(76.6)	16(13.8)	100(86.2)		
Training Years	3.41(1.70)	3.27(1.66)	3.75(1.74)	-2.584	0.010	
Weight (Kg)	63.27(15.01)	65.35(15.30)	58.01(12.89)	4.541	< 0.001	
Height (m)	173.12(14.21)	175.78(15.13)	166.45(8.57)	6.427	< 0.001	
BMI (Kg/m <sup>2</sup> )	20.83(4.65)	20.82(4.21)	21.03(5.29)	-0.431	0.575	

### 3.3. Statistical analysis

Firstly, SPSS 26.0 (SPSS Inc., Chicago, IL, USA) was used to conduct descriptive statistics (including reporting the means and standard deviations of the variables and the distribution of each variable), reliability and validity tests for the scales, tests of variance (including independent samples *T*-tests) and correlation analyses (testing for correlations between variables). Secondly, AMOS 24.0 ( SPSS Inc., Chicago, IL, USA ) was used to conduct confirmatory factor analysis (to remove outliers and estimate reliability), model fit checks, and mediating effect tests. Model fit metrics include Chi-square/Df, the goodness of fit index (GFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA). GFI, CFI values greater than 0.9, Chi-square/Df less than 3, RMSEA less than 0.08, fit indices that meet these requirements to reflect an acceptable model fit [63,70] [-] [72]. We used the bootstrap method with 5000 sampling replicates to estimate 95 % confidence intervals (CIs) for significance testing of mediating effects. All variables in the model analysis were standardised by subtracting the mean and dividing by the standard deviation of each variable. This standardisation method, known as z-score transformation, is commonly used to compare variables with different scales and units. Specifically, we calculated the z-score standardization as follows:

$$z = (x - \mu) / \sigma$$

Where *z* is the z-score, *x* is the raw score to be standardised,  $\mu$  is the sample’s mean, and  $\sigma$  is the standard deviation of the sample. The standardised variables were used as inputs for the model testing and estimation of direct and indirect effects, and this standardisation method enabled all variables to be analysed on a standard scale [73].

## 4. Results

### 4.1. Reliability and convergent validity tests of measurement models

Before conducting structural equation modelling (SEM), we rigorously assessed the reliability and validity of our measurement models. For each latent variable, we examined standardised factor loading coefficients, squared multiple correlations (SMC), composite reliability (CR), and the average variance extracted (AVE). These metrics provide insights into the reliability and validity of our measurement instruments. As shown in Table 2, the standardised factor loading coefficients ranged from 0.49 to 0.918, exceeding the recommended threshold of 0.5 [63]. SMC values ranged from 0.24 to 0.843, all comfortably above the threshold of 0.2, indicating satisfactory reliability [74]. CR values ranged from 0.737 to 0.917, surpassing the acceptable threshold of 0.7 [75]. AVE values, which measure the average explanatory power of each construct, ranged from 0.364 to 0.734, with most exceeding the acceptable range of 0.36–0.5, indicating good explanatory power [76].

To further establish the discriminant validity of our measurement model, we calculated the square root of the AVE for each construct and compared it to the absolute values of the correlation coefficients between latent variables (see Table 3). The square roots of AVE are consistently more significant than the correlations between constructs within the same column, affirming the discriminant

**Table 2**  
Summary results for confirmatory factor analysis of all factors and items.

FACTORS	Std	SMC	CR	AVE
<b>Self-Concept Clarity</b>			0.746	0.429
Sometimes, I think I know other people better than I know myself.	0.705	0.497		
Sometimes, I feel I am not the person I appear to be.	0.747	0.558		
I seldom experience conflict between the different aspects of my personality.	0.490	0.240		
My beliefs about myself seem to change very frequently.	0.648	0.420		
<b>Athletic Identity</b>			0.843	0.585
It is proud to be an athlete.	0.578	0.334		
You are a good athlete.	0.918	0.843		
You are a capable athlete.	0.911	0.830		
I was doing well during sports competitions.	0.576	0.332		
<b>Athlete engagement</b>			0.917	0.734
I feel energised when I participate in my sport.	0.819	0.671		
I believe I have the skills/technique to be successful in my sport.	0.910	0.828		
I feel excited about my sport.	0.832	0.692		
I am devoted to my sport.	0.862	0.743		
<b>Quality of life</b>			0.737	0.364
How would you rate your quality of life?	0.630	0.397		
How much do you enjoy life?	0.661	0.437		
How well are you able to concentrate?	0.671	0.450		
Are you able to accept your bodily appearance?	0.575	0.331		
<b>Smartphone use</b>			0.824	0.548
I am missing planned work due to smartphone use.	0.505	0.255		
I will not be able to stand not having a smartphone.	0.745	0.555		
I was feeling impatient and fretful when I was not holding my smartphone.	0.852	0.726		
I have my smartphone in my mind even when not using it.	0.809	0.654		

Note. Std, Standardised factor loading coefficients.

**Table 3**  
Discriminatory validity and Correlation matrix.

	mean ± SD	AVE	1	2	3	4	5
1. SCC	3.16 ± 0.74	0.429	<b>0.655</b>				
2. AI	4.16 ± 0.61	0.585	-0.039**	<b>0.765</b>			
3. AE	4.22 ± 0.63	0.734	-0.039**	0.736**	<b>0.857</b>		
4. SU	2.38 ± 0.79	0.364	0.334**	-0.114**	-0.149**	<b>0.603</b>	
5. QOL	2.38 ± 0.79	0.548	-0.211**	0.408*	0.539**	-0.117**	<b>0.740</b>

Note: \*\*P < 0.01; \*P < 0.05; The square root of AVE in bold diagonals.

validity of our measurement model.

4.2. Structural model

A structural model was constructed to test the hypotheses outlined in our study (see Fig. 2). The structural model exhibited an acceptable model fit (Chi-square = 358.127, df = 162, Chi-square/Df = 2.211, GFI = 0.921, CFI = 0.948, RMSEA = 0.054). In support of our hypotheses, the path coefficients revealed significant relationships: The path from athletic identity to athlete engagement ( $\beta = 0.61, p < 0.05$ ) and quality of life ( $\beta = 0.41, p < 0.001$ ) was positive and statistically significant, validating hypotheses 2 and 5. The path from quality of life to athlete engagement was positive and statistically significant ( $\beta = -0.22, p < 0.001$ ), supporting hypothesis 4. However, hypotheses 1, 3, 8, 9, and 10 were not supported: The path from self-concept clarity to athlete engagement ( $\beta = 0.04, p = 0.344$ ) was not statistically significant, contrary to hypothesis 1. The path from self-concept clarity to quality of life ( $\beta = -0.21, p < 0.001$ ) and smartphone use ( $\beta = 0.33, p < 0.001$ ) was statistically significant but not in alignment with hypotheses 3 and 8, respectively. The path from athletic identity to smartphone use ( $\beta = -0.11, p < 0.05$ ) was statistically significant, but hypothesis 10 was unsupported. The path from smartphone use to athlete engagement ( $\beta = -0.06, p = 0.171$ ) was not statistically significant, contrary to hypothesis 9.

4.3. Testing for the mediation model

To test the mediation model, we employed bias-corrected nonparametric percentage Bootstrap 95 % Confidence Intervals (CIs) to evaluate the mediating roles outlined in our hypotheses. The results are summarised as follows: The direct effect of athletic identity on athlete engagement was significant ( $ES = 0.610, 95 \% CI = 0.472, 0.715$ ). The direct effect of self-concept clarity on athlete engagement was insignificant ( $ES = -0.042, 95 \% CI = -0.047, 0.139$ ). The indirect effect of quality of life and smartphone use on athletic identity and self-concept clarity on athlete engagement was 0.292 (95 % CI = 0.116, 0.566). The mediating effect consisted of four the indirect effects consisted of four indirect effect pathways (Table 4), with a significant indirect effect for “self-concept clarity to quality of life to athlete engagement” ( $ES = -0.054, 95 \% CI = -0.114, -0.019$ ). The indirect effect of “self-concept clarity to smartphone use to athlete engagement” was not significant ( $ES = -0.017, 95 \% CI = -0.056, 0.007$ ), and the indirect effect of “athletic identity to quality of life to athlete engagement” was significant ( $ES = 0.202, 95 \% CI = 0.114, 0.349$ ), “athletic identity to smartphone

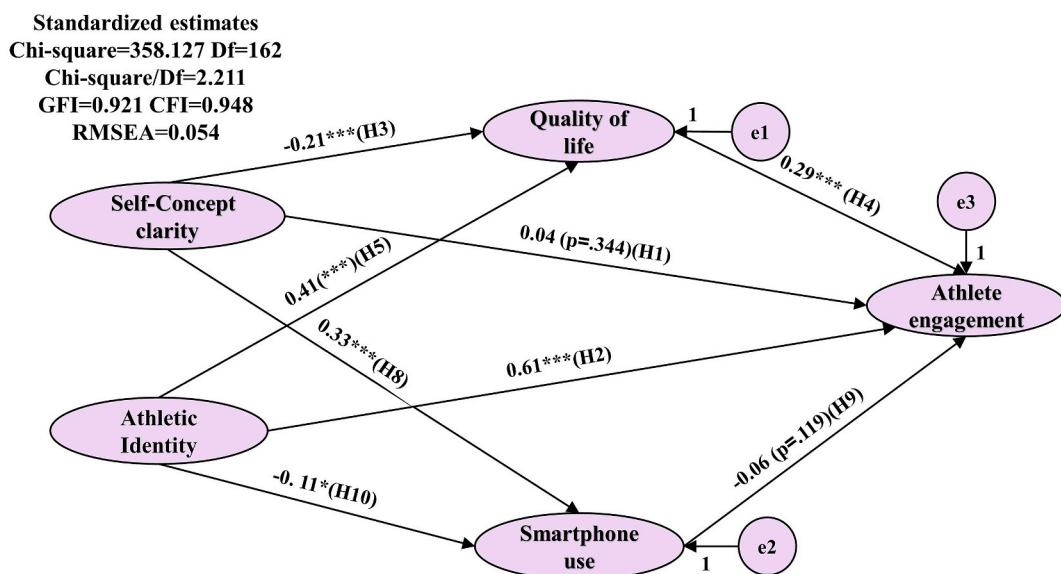


Fig. 2. Structural model. Note: The dashed lines represent non-significant paths; \*\*\*P < 0.001; \*P < 0.05.

**Table 4**  
Bootstrap test for mediation effects.

Parameter	ES	P	Bias-corrected percentile method	
			Lower	Upper
SCC-QOL-AE (H6)	-0.054	0.002	-0.114	-0.019
SCC-SU-AE (H11)	-0.017	0.165	-0.056	0.007
AI-QOL-AE (H7)	0.202	< 0.001	0.114	0.349
AI-SU-AE (H12)	0.011	0.125	-0.003	0.049
SCC-AE ( H1 )	0.042	0.343	-0.047	0.139
AI-AE ( H2 )	0.610	0.001	0.472	0.715
Total Indirect effect	0.143	0.002	0.051	0.282
Total effect	0.292	0.001	0.116	0.566

Note: Variables have been normalised; Bootstrap sample size = 5000; ES, Estimates; SCC, Self-concept clarity; QOL, quality of life; AE, Athlete engagement; SU, Smartphone use; AI, Athletic identity.

use to athlete engagement” was not significant ( $ES = 0.011$ , 95 % CI =  $-0.003, 0.049$ ). Therefore, hypotheses 6 and 7 were supported, and hypotheses 11 and 12 were not. Our findings highlight the complexity of the relationships among self-concept clarity, athlete identity, quality of life, smartphone use, and athlete engagement.

## 5. Discussion

Self-concept clarity, athletic identity, and athlete engagement in youth athletes are increasing interest in coaches, teachers, and sports psychologists [77–79]. However, few studies have explored the interrelationships between self-concept clarity, athletic identity, and athlete engagement in youth athletes and the potential mediating roles. Therefore, this study contributes to a systematic understanding of factors influencing athlete engagement in youth athletes, providing insights to develop their potential and strengths.

### 5.1. Self-concept clarity, athletic identity, and athlete engagement

We hypothesised a positive correlation between self-concept clarity and athlete engagement in youth athletes (H1). Although the results showed no significant association, they still advance knowledge on mechanisms shaping athlete engagement. Leiter & Maslach [80] argue that engagement is primarily impacted by environmental not just personal factors. DeFreese & Smith [81] examined organisational environmental factors contributing to athlete engagement. They identified aspects such as a Sense of Control, Reward, Community, Fairness, Values, and Workload as significantly associated with athlete engagement. Self-validation theory suggests that self-concept clarity enables individuals to foresee and manage reality, potentially increasing cognitive engagement [22]. This initial investigation provides groundwork on self-concept clarity and athlete engagement.

Conversely, our research supports the hypothesis that athletic identity positively correlates with athlete engagement (H2). This aligns with findings from Babic et al. [82] and Poux & Fry [40], suggesting that the exposure of adolescent athletes to their athletic identity significantly impacts their mental well-being. Brewer et al. [83] argue that athletic identity can influence individuals' sports participation and even act as a deterrent to engaging in other activities, such as education and social interactions. Our study suggests that heightened athletic identity equips youth athletes with greater confidence in achieving their goals through their skills and efforts. Consequently, they exhibit enhanced focus during daily training and competitions, embracing challenges rather than avoiding them and giving their best when facing adversity. Conversely, youth athletes with lower levels of athletic identity may exhibit diminished enthusiasm for competitions and training. These individuals often bear a psychological burden, fearing they may not meet their coach's expectations or fulfil their designated tasks. They may adopt a passive, avoidance-oriented approach when confronted with difficulties or setbacks. As Hughes [84] argues, low identity, enthusiasm, and intention among athletes can detrimentally affect their engagement in sports. Drawing from self-determination theory, satisfying basic psychological needs among youth athletes heightens their motivation to participate in training and competition. This reinforces athletic identity, promoting or enhancing athlete engagement [79]. Additionally, the pragmatic aspects of self-validation theory suggest that self-validation aligns a youth athlete's athletic identity with external perceptions. This fosters mutual recognition of their athletic identity and contributes to its stability.

### 5.2. The mediating role of quality of life and smartphone use

Our study delves into the mediating roles of quality of life and smartphone use in the relationship between self-concept clarity, athletic identity, and athlete engagement among youth athletes. The findings illuminate the complex interplay of these factors in shaping young athletes' psychological well-being and engagement.

#### 5.2.1. Quality of life and its mediator

Quality of life, a multidimensional construct encompassing physical, psychological, social, and environmental facets, emerges as a pivotal mediator in our study. This construct offers insights into various aspects of an individual's life, including their satisfaction with physical health, mental well-being, social relationships, and environmental conditions [66]. Drawing from self-determination theory, we posit that meeting autonomy and related needs within a sports context is linked to heightened athlete engagement and overall



well-being [85]. Our findings align with the work of Sahlin & Lexell [86], who noted a positive association between self-concept clarity and life satisfaction. Moreover, Ledochowski et al. [87] emphasised that athletes with a higher quality of life exhibit greater engagement in training and competition.

In the proposed self-concept clarity to quality of life to athlete engagement pathway model, youth athletes experience enhanced cognitive and environmental support, enabling their needs to be met and motivating them to participate in sports activities actively. This engagement facilitates continuous cognitive, emotional, and behavioural involvement, empowering them to break through barriers and reach their full potential [88]. Athlete engagement, in this context, indicates positive psychological well-being, fostering resilience and tenacity [8]. Thus, enhancing self-concept clarity among youth athletes significantly improves quality of life and athlete engagement.

Our study also establishes that quality of life mediates the relationship between athletic identity and athlete engagement in youth athletes. Athletes' development of a sporting identity over time is a process that significantly influences their performance and self-esteem in sports [89]. Groff et al. [87] corroborated this notion by concluding that athletic identity is the most potent predictor of quality of life [49]. Furthermore, a higher quality of life increases athlete engagement.

In the proposed positive athletic identity to quality of life to an athlete engagement model, youth athletes' goals, beliefs, and values are continually reinforced, leading to coherence in emotions, cognition, and behaviour. This constructive model enhances athletes' self-confidence and inspires them to achieve their goals [90]. Therefore, strengthening athletic identity in youth athletes substantially impacts the quality of life and athlete engagement.

### 5.2.2. Smartphone use and its implications

Although our study did not reveal evidence to support the mediating role of youth athletes' smartphone use in the relationship between self-concept clarity and athletic identity on athlete engagement, it did yield noteworthy insights into this area. Specifically, we found that self-concept clarity positively correlated with smartphone use among youth athletes, contrary to the findings of Kong et al. [91] and Servidio et al. [92]. This divergence may be attributed to the specific characteristics of our study population—youth athletes in professional sports schools. Individuals with a more apparent self-concept clarity may gravitate towards increased smartphone use, which is not necessarily indicative of smartphone addiction. For these athletes, smartphones serve as a means to spend leisure time, distinct from their rigorous training and competition routines and may contribute to maintaining a stable self-concept.

Furthermore, our study uncovered a negative correlation between athletic identity and smartphone use among youth athletes. This finding deviates from the study by Liu et al. [61]. As previously mentioned, this discrepancy may be attributed to the unique context of our study. It is plausible that higher athletic identity is associated with increased smartphone use as athletes seek additional avenues for engagement outside of their sporting commitments. Many studies have highlighted the positive impact of athletic identity on performance satisfaction and the achievement of sporting goals [48]. A robust athletic identity enhances individuals' confidence and facilitates adaptation and development [93]. By discussing the implications of these findings, we gain a deeper understanding of the intricate dynamics involving smartphone use among youth athletes and its relationship with self-concept clarity and athletic identity. These nuances contribute to more comprehensively exploring the factors influencing athlete engagement.

## 5.3. Practical implications and limitations

### 5.3.1. Practical implications

Our findings have practical implications for youth sports coaching, athlete development, and management. We offer the following practical recommendations: Firstly, nurturing athletic identity is paramount. Coaches and managers should prioritize interventions to shape youth athletes' role perceptions and foster robust identification with their athletic personas. Promoting pride in their athletic roles and providing opportunities to immerse in their athlete identities could substantially enhance engagement and commitment. Secondly, optimizing quality of life is imperative. As a critical driver of engagement, holistic well-being across physical, psychological, social, and environmental realms should be strengthened. Comprehensive support systems are advocated to boost physical health, mental wellness, social relationships, and environmental quality. Cultivating an environment where youth athletes feel secure and supported in all aspects can facilitate engagement and satisfaction.

### 5.3.2. Limitations

Our study underscores the importance of bolstering athletic identity and elevating the quality of life to enhance athlete engagement among youth athletes. Nonetheless, several limitations warrant consideration. Firstly, our study relied on an online survey platform, resulting in self-reported data by participants, which may introduce bias. Secondly, the study's cross-sectional design prevents establishing causality between the examined variables. Longitudinal studies are needed to gain deeper insights into the dynamics of these relationships over time. Thirdly, the moderate sample size of only Chinese youth athletes restricts the findings' generalizability. Future research should replicate this study with diverse, larger samples across cultural contexts for a more robust assessment of applicability. Finally, this study extends applications of self-validation and self-determination theories in youth athletes, though further research could delve deeper into their nuanced relevance and refinements.

## 6. Conclusion

Our cross-sectional study helps fill a gap in existing research on athlete engagement in adolescent athletes. Previous research on youth athletes has predominantly focused on injury prevention, treatment, and professionalisation, primarily within the 'athlete'

identity framework. However, there is limited investigation of how factors like self-concept clarity, athletic identity, quality of life and smartphone use may influence youth athletes' engagement. By examining these relationships in a sample of Chinese youth athletes, our study provides novel evidence on the factors shaping athlete engagement during adolescent development. It provides new evidence that self-concept clarity and athletic identity in youth athletes are essential factors in promoting athlete engagement, indirectly predicting athlete engagement through the mediating role of quality of life and smartphone use. Coaches and athletic training administrators should be aware of the role of athletes' self-concept clarity, athletic identity, quality of life, and smartphones in influencing athlete engagement in training and competition, and how to enhance self-concept clarity, improve athletic identity and quality of life, and use smartphones appropriately as a way to enhance athlete engagement in youth athletes.

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### Ethical statements

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the School of Public Health Ethics Committee, Shandong University (No. 20190609).

### Informed consent

Informed consent was obtained from all participants before the data was collected. We informed each participant of their rights and to safeguard their personal information.

### Data availability statement

The data that support the findings of this study are available from the corresponding author, G. Sun, upon reasonable request.

### Additional information

No additional information is available for this paper.

### CRedit authorship contribution statement

**Qianjin Wu:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Yusen Tan:** Writing – original draft, Resources, Project administration, Investigation, Conceptualization. **Guoxiao Sun:** Writing – review & editing, Supervision, Resources, Project administration, Methodology, Conceptualization. **Qingjian Ding:** Supervision, Resources, Project administration, Investigation.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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