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Perceived development of psychological characteristics in Male and Female elite gymnasts

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This study examined the perceived development of psychological characteristics in male and female elite gymnasts. Fourteen participants (seven females and seven males) were engaged in individual semi-structured interviews, which were subjected to an inductive-deductive analysis procedure. Results revealed the main psychological characteristics perceived to be developed by all the participants pertained to achievement motivation, performance enhancement cognitive skills (e.g., focusing, imagery), and affective and psychosomatic skills (e.g., ability to deal with anxiety; relaxation). Although all the participants perceived that their psychological characteristics were influenced by different sources (e.g., social sport environment; family; sport process) and through a variety of methods (e.g., social support; unpleasant social interactions; competitive experiences), some gender differences were suggested. Family influences were perceived as constant among females, whilst the role of competitive experiences was perceived as predominant amongst males. Results are discussed in the context of previous psychological development literature and theories of gender development.

KEY WORDS: Elite sport, Gender, Psychological development, Social influences

Several studies in the sport psychology literature have examined the development of psychological characteristics of elite performers. For example, Hanton and Jones (1999) have identified how elite swimmers, aged between 19 and 27, acquired and developed effective cognitive skills and strategies that enabled them to interpret pre-competitive anxiety as facilitative or beneficial for performance and not as debilitating or detrimental. They reported that this skill had been acquired over time through natural learning experiences. This process, unfolding throughout the swimmer's career, was made up of two components: (a) listening and taking into account the advice

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of parents, coaches, and more experienced competitors, and (b) performing at different competitive standards and against different opponents.

Gould, Dieffenbach and Moffet (2002) confirmed the importance of social background (i.e., family, coach, exposure to elite athlete models) in the development of psychological characteristics of elite athletes. Using semi-structured interviews associated with a battery of psychological inventories, Gould et al. (2002) showed that 10 characteristics underlie Olympic athletes' striving for excellence: the ability to cope with and control anxiety; confidence; mental toughness/resiliency; sport intelligence; the ability to focus and block out distractions; competitiveness; a hard-work ethic; the ability to set and achieve goals; the ability to be coached; high levels of dispositional hope; optimism; and adaptive perfectionism.

The authors also identified different factors which could have an influence on the acquisition and development of these characteristics throughout the athletes' career. Six sources of influence were identified: the community, the family, the individual himself or herself, non-sport personnel, sport environment personnel, and the sport process. The community includes the individual and the general environment (e.g., high standard of living, sense of values), where an athlete is immersed during her or his childhood and teenage years. Family includes grand-parents, parents, siblings, and significant others. The individual him or herself includes genetic factors, maturity, and individual self-development. Non-sport personnel encompasses friends and teachers, and sport environment personnel is made up of agents, coaches, other/former elite athletes, competitors, sport psychology consultants, and teammates. The last source, the sport process, is composed of sport characteristics, such as its nature, sport experiences, sport adversity, and sport competition organization. Ways in which these sources influenced the athletes were both direct, like teaching, and indirect, involving modeling and unintentionally creating certain psychological environments.

In a study exploring competitive strategies, Calmels, d'Arripe-Longueville, Fournier and Soulard (2003) found that the strategies developed by international level female gymnasts through natural learning experiences over time were wider and more elaborate than those of their national level counterparts, but akin to those used by national level gymnasts who had benefited from psychological skills training. Recent studies based on longitudinal (Weiss & Weiss, 2006) or cross-sectional (Weiss & Weiss, 2007) designs identified the predictors of sport commitment among competitive female gymnasts. However the way elite gymnasts develop their psychological characteristics throughout their career has not been explored.

Furthermore, although some of the aforementioned studies sometimes included male and female elite athletes, gender differences in developing psychological characteristics were not specifically investigated. Many studies in the sport psychology literature have reported gender differences in psychosocial characteristics. These include: confidence; anxiety; goal orientation; and moral judgment (see Gill, 2004 for a review). Whilst differences in these factors seem to decrease in elite athletes (e.g., Martens, Vealey, & Burton, 1990; Petherick & Weigand, 2002) little is known about the gender differences in athletes' psychosocial development.

In sum, the sport psychology literature has shown that personal characteristics, sport experiences, and positive social environments have been predominant factors in the development of psychological characteristics of elite athletes (e.g., Gould et al., 2002). Although considerable research has investigated gender differences in psychosocial characteristics in sports and although gender conceptions and roles are known to depend on different subsystem sources of influence (e.g., Bussey & Bandura, 1999), no study to date has identified whether psychological characteristics develop differently in male and female athletes. The present study was designed to explore psychological characteristics and their perceived development in male and female elite gymnasts, and to identify potential gender differences that could be examined with a larger sample in future studies. A qualitative approach based on retrospective semi-structured interviews was deemed as the most appropriate in the present study.

Methods

PARTICIPANTS

The participants were 14 French elite gymnasts, 7 females and 7 males who had an average of ten years of international experience at a senior and junior level. These participants were selected because gymnastics requires the development of many psychosocial skills at a young age to cope with family distance or separation, competitive anxiety, injury and failure (Calmels et al., 2003). All of the gymnasts were recruited from an elite national team and were ranked between 1st and 10th at the National French Championship. Most of them had participated in European or World Championships and Olympic Games in 2000, 2004, or 2008. Ages ranged from 14 to 18 years ($M = 15.6$, $SD = 2.2$ years). All gymnasts had 25 hours of physical training per week and participated voluntarily in the study. Written informed consent was obtained from the participants and, in the case of participants under the age of 18, parental consent was also obtained. The study was accepted by the local ethics committee. To guarantee anonymity, a coding system was used to identify the participants. Female gymnasts were coded as F1 to F7, whereas male gymnasts were identified as M1 to M7.

INTERVIEW GUIDE

Fourteen gymnasts underwent individual in-depth qualitative interviews, ranging from 60 minutes to 100 minutes in length. The goal of the interview was to identify the psychological characteristics and the sources and modes of development of these characteristics throughout salient moments of the gymnasts' careers. The interview guide was divided into five parts (Hanton & Jones, 1999; Harwood & Swain, 2001): (a) introductory comments and instructions; (b) early experiences within gymnastics; (c) increased commitment and developing competitive experience; (d) total commitment (junior and senior elite competitive experiences; current experiences); (e) perceptions of the interview and additional comments. Previous literature based on Bloom's (1985) work (Hanton & Jones, 1999; Harwood & Swain, 2001; Scanlan, Ravizza, & Stein, 1989) was used to help gather the detailed information relating to each athlete's period and to determine when one phase ended and another started.

Questioning within each period of development followed a similar format. The gymnast was invited to recall and describe his or her activity during particular training sessions or specific competitive events both chronologically and in detail (Côté, Ericsson, & Law, 2005; Ericsson & Simon, 1993). To help the participants reconstruct his or her experiences accurately, Spradley's (1979) and Rubin and Rubin's (1995) guidelines for in-depth interviews were followed. Three types of questions were used: main questions; probe questions; and follow-up questions. Main questions consisted of a contextual and temporal description of significant training or competitive situations (e.g., "Could you describe your best competition during this specific period? What was the content of a typical training session in this period?"). The probe questions then allowed the interviewer to identify the different psychological characteristics involved in the situation or the mental skills utilized by the gymnast (e.g., "If I understand what you told me, you started to use imagery in this period, didn't you?"). The questioning then aimed to gather information about the way the identified psychological characteristic developed. Questions about the underlying factors of psychological development were based on the existing literature (e.g., Gould et al., 2002; Harwood & Swain, 2001). Examples of questions include: "What factors or experiences do you feel contributed to your self-confidence in this specific period?" Responses were followed by questions targeted on the role of other potential sources of development (e.g., social environment; competitive experiences; maturity) and methods of influence (e.g., Can you tell me a little bit more about what your mother used to tell you before each competition? Why did you consider this gymnast as a model? Why do you consider you needed to be yelled at by your coach to focus and commit better?"). Before moving to another period of the gymnast's career, the interviewer checked with the participant the perception she/he had concerning the influence of the different mentioned sources and modes of development of the psychological characteristics. When several sources and modes of influence emerged for the same psychological characteristic, the participant was invited to elaborate further about her/his respective influence (e.g., "If I understand well, in this period, also a little bit thanks to your mother, is that right? Can you tell me a little bit more about their respective role?"). Therefore, the interview format was semi-standardized: while the same sets of questions were asked in the same manner, the presentation of topics within each section was free to vary with the flow of the discussion and was adapted to the participant's responses. The closing section summarized the main topics of the interview and invited the participant to discuss any issues that may have been overlooked by the researcher.

PROCEDURE

A pilot study was first conducted to determine the clarity of the interview questions, the total interview time, and to obtain feedback from the young gymnasts that could improve the interview schedule. A few changes in the interview schedule were made following the pilot work. The interviews with the gymnasts were held in a private room without distractions. At the beginning of each interview, the purpose of the study and the format of the interview were explained to the participant. Permission to make an audio recording of the interview was obtained. Two researchers were present during all interviews: One was responsible for conducting the interview. The second took notes, summarized the main ideas of the participant's responses, and asked the participant additional questions if necessary to collect more detailed information. Verbatim transcriptions of the interviews were provided for the gymnasts and appointments were made to check the researchers' transcripts, the data derived, and the researchers' initial conceptualizations (Lincoln & Guba, 1985). Only minor changes were suggested by the interviewees.

INTERVIEWERS

The interviews were conducted by a female researcher with doctoral degree in exercise and sport psychology. The interviewer was experienced in qualitative methods and had 15 years experience as a gymnast and coach and 10 years experience in sport psychology research and consultancy. The second researcher was also experienced in sport psychology and qualitative methods.

DATA ANALYSIS

The data was transcribed from the audio tape to 410 single-spaced pages. Content analysis was used to analyze the interview transcripts. Content analysis is a procedure that organizes transcribed material by coding large amounts of interview data into blocks that represent a common theme (Côté, Salmela, Baria, & Russell, 1993). In this study, both deductive and inductive content analyses (Patton, 2002) were used. The data were analyzed in several steps. Analysis started deductively by coding quotes pertaining to the gymnasts' psychological characteristics, their sources and methods of influence using Gould et al. (2002) labeling, for each period of the participants' career (i.e., early experiences; increased commitment; total commitment). The analysis continued inductively by combining the remaining quotes into new themes and dimensions. The following step consisted in ranking the different sources and methods of influence for each identified psychological characteristic, according to the respective perceptions of the female and male gymnasts. The analysis ended with the computation of frequency for each source of influence across male and female participants (see Tables).

Five investigators, trained in qualitative methods, were involved in the coding process. The two interviewers, with the help of two postgraduate students who were proficient in gymnastics, divided the interview transcripts into meaningful pieces of information called meaning units (MU), according to the purpose of the study (i.e., psychological characteristics, sources of influence, methods of influence, and periods of development). Within each

main category, MU were compared and grouped according to common features into increasingly more complex categories, based on new labels or preexisting concepts. In the latter case, we ensured that the codes and the categories were embodied in rather than forced on the data (Strauss & Corbin, 1998). The interviews were independently coded by two investigators, and the groups and labels were checked by two other investigators who provided feedback. Then the investigators got together and extensively compared and discussed their analyses until agreement and saturation were reached, that is until no new information about each category emerged (Strauss & Corbin, 1998). The fifth person was considered a disinterested-peer (Lincoln & Guba, 1985, p.308), and checked the relevance of the categorization process.

Data credibility was strengthened in three ways (Lincoln & Guba, 1985): through investigators' triangulation (i.e., the independent coding of the data, comparison, and discussion until a consensus was reached), checking of the categorization process by an expert researcher in qualitative methods, and the participant's examination of the researchers' scripts and their interpretation to make sure that the information that was collected was authentic. This procedure only entailed minor changes.

Results

The content analyses of the interview responses yielded 2415 MU related to the purpose of the study. The identified psychological characteristics (i.e., motivational characteristics; performance enhancement cognitive skills; affective and psychosomatic skills) sources and methods of influence, and the main periods of development are reported in Tables I, II and III, for females and males. Due to the amount of subcategories, only the most significant verbalizations and details related to the psychological characteristics' development were provided in the text below.

Motivational characteristics. Motivational characteristics have been described through five higher-order themes: (a) commitment, (b) achievement goals, (c) persistence, (d) self-determination, and (e) self-confidence (see Table I). The first higher-order theme, *Commitment*, was mentioned by all the gymnasts, as an important psychological skill. All the participants reported that they perceived their commitment had been influenced by the creation of a mastery motivational climate (including encouragement, social support and work ethic) by their sport social environment (i.e., coaches and teammates) throughout their career. The modeling role of teammates was apparent in both male and female reports in the increased and total commitment years. More controlling contexts including an increase of the training load and unpleasant coach-athlete or athlete-athlete interactions also emerged as important to the gymnasts' commitment when developing competitive experiences. A female gymnast explained.

TABLE I
Motivational Characteristics: Sources, Methods of Influence, and Main Periods of Development among Male and Female Elite Gymnasts.

Motivational	Characteristics	Gender	Sources of Influence	Methods of Influence	Main Periods of Development
Commitment		Female [100%]	Sport social environment [100%]	Creating a mastery motivational climate including encouragement, social support, work ethic and advice on the gymnast's career (C+T)	Throughout the career
				Learning from models (T)	Increased commitment Total commitment
				Creating a controlling context involving an increase of the training load and unpleasant interactions with the gymnast (C+T)	Increased commitment Total commitment
			Family [100%]	Creating a mastery climate including encouragement, social support and work ethic (F+M+S)	Throughout the career
				Learning from models (S)	Throughout the career
		Sport process [28%]	Learning from competitive or training experiences	Increased commitment Total commitment	
		Male [100%]	Sport social environment [100%]	Creating a mastery motivational climate including encouragement, social support, work ethic and advice on the gymnast's career (C+T)	Throughout the career
				Learning from models (T)	Increased commitment Total commitment
				Creating a controlling context involving an increase of the training load and unpleasant interactions with the gymnast (C)	Increased commitment Total commitment
			Sport process [42%]	Learning from competitive or training experiences	Increased commitment Total commitment

Segue

Segue TABLE I

Motivational	Characteristics	Gender	Sources of Influence	Methods of Influence	Main Periods of Development
			Family [28%]	Creating a mastery climate including social support and work ethic (F+M+S)	Early experiences
				Learning from models	Early experiences
Achievement goals	Self-referenced goals (learning goals and perfectionism)	Female [100%]	Sport social environment [100%]	Creating a mastery motivational climate including, fun, personal progress, work ethic and pleasant interactions with the gymnast (C)	Throughout the career
				Creating a controlling learning climate involving an increase of the training load and unpleasant interactions (C)	Increased commitment Total commitment
				Learning from models (T)	Total commitment
			Family [42%]	Creating a mastery motivational climate (F+M+S)	Throughout the career
		Male [100%]	Sport social environment [100%]	Creating a mastery motivational climate including fun, personal progress, work ethic and pleasant interactions with the gymnast (C)	Throughout the career
				Creating a controlling context involving an increase of the training load (C)	Increased commitment Total commitment
				Learning from models (T)	Total commitment
			Sport process [85%]	Learning from training and competitive experiences	Increased commitment Total commitment
			Family [28%]	Learning from models (S)	Early experiences

Segue

Segue TABLE I

Motivational	Characteristics	Gender	Sources of Influence	Methods of Influence	Main Periods of Development
Achievement goals (follow-up)	Other-referenced goals	Female [100%]	Family [71%]	Creating a performance motivational climate (F+M)	Increased commitment
				Learning from models (S)	Increased commitment
			Sport social environment [42%]	Creating a performance motivational climate (C)	Increased commitment Total commitment
				Learning from models (T)	Increased commitment Total commitment
		Sport process [28%]	Learning from competitive or training experiences	Increased commitment	
		Male [100%]	Sport process [85%]	Learning from competitive or training experiences	Throughout the career
			Sport social environment [28%]	Creating a performance motivational climate (C)	Throughout the career
				Learning from models (T)	Throughout the career
Persistence	Female [71%]		Sport social environment [57%]	Providing encouragement or social support (C+T)	Increased commitment Total commitment
		Creating a mastery motivational climate including work ethic, progress and advice on the gymnast's career (C)		Increased commitment Total commitment	
		Learning from models (T)		Total commitment	
		Creating a controlling climate involving unpleasant interactions with the gymnast and an increase of the training load (C)		Increased commitment Total commitment	

Segue

Segue TABLE I

Motivational	Characte- ristics	Gender	Sources of Influence	Methods of Influence	Main Periods of Development
			Family [42%]	Providing encouragement and social support (M+S)	Throughout the career
				Creating a controlling climate involving pressure on the gymnast (F+M+S)	Increased commitment Total commitment
				Creating a mastery motivational climate including hard work ethic, progress and advice on the gymnast's career (M+F+S)	Increased commitment Total commitment
			Individual development [14%]	Genetics; Maturity	Increased commitment Total commitment
			Sport process [14%]	Learning from competitive or training experiences	Increased commitment
		Male [100%]	Sport social environment [42%]	Providing encouragement or social support (C+T)	Increased commitment Total commitment
				Creating a mastery motivational climate including work ethic and advice on the gymnast's career (C+T)	Increased commitment Total commitment
				Creating a controlling climate involving unpleasant interactions with the gymnast and an increase of the training load (C)	Increased commitment Total commitment
			Family [42%]	Providing encouragement or social support (F+M+S)	Increased commitment Total commitment
				Creating a mastery motivational climate including hard work ethic and advice on the gymnast's career (M)	Increased commitment Total commitment

Segue

Segue TABLE I

Motivational	Characteristics	Gender	Sources of Influence	Methods of Influence	Main Periods of Development	
			Individual development [28%]	Maturity	Total commitment	
			Sport process [14%]	Learning from competitive or training experiences	Throughout the career	
Self-determination	Intrinsic motivation	Female [100%]	Sport social environment [100%]	Creating a mastery climate emphasizing fun and supporting the gymnast's autonomy (C)	Early experiences	
Self-determination (follow-up)	Intrinsic motivation (follow-up)	Male [100%]	Sport social environment [100%]	Creating a mastery climate supporting the gymnast's autonomy and including advice on his career (C)	Early experiences	
	Introjected and identified regulation	Female [100%]	Individual development [28%]	Genetics; maturity	Increased commitment Total commitment	
			Family [28%]	Making some financial sacrifices (F+M)	Increased commitment Total commitment	
				Learning from models (S)	Increased commitment	
				Sport social environment [28%]	Creating a mastery climate supporting the gymnast's autonomy and including advice on her career (C+T)	Total commitment
		Male [100%]	Sport social environment [42%]		Creating a mastery climate supporting the gymnast's autonomy and including advice on his career (C+T)	Increased commitment Total commitment
				Learning from models (T)	Increased commitment	
			Family [28%]		Creating a mastery climate supporting the gymnast's autonomy and including advice on his career (F+M+S)	Throughout the career

Segue

Segue TABLE I

Motivational	Characteristics	Gender	Sources of Influence	Methods of Influence	Main Periods of Development
				Learning from models (S)	Increased commitment
				Making some financial sacrifices (F+M)	Increased commitment Total commitment
			Individual development [14%]	Maturity	Throughout the career
Self-confidence		Female [100%]	Family [100%]	Providing encouragement or social support (M+S)	Throughout the career
			Sport social environment [100%]	Creating a mastery motivational climate including advice on the gymnast's career (C+T)	Throughout the career
				Creating a controlling context including unpleasant interactions with the gymnast (C)	Increased commitment Total commitment
			Sport process [28%]	Learning from competitive or training experiences	Increased commitment
		Male [100%]	Family [100%]	Providing encouragement or social support (F+M)	Increased commitment Total commitment
			Sport social environment [100%]	Providing encouragement and social support (C+T)	Increased commitment Total commitment
				Creating a mastery motivational climate including advice on the gymnast's career (C+T)	Throughout the career
			Sport process [71%]	Learning from competitive or training experiences	Throughout the career

Notes. The values listed next to the categories represent the percentage (%) of the sample of males and females; F: Father; M: Mother; S: Siblings; C: coach; T: teammates.

They said: “Look how fat she is!” But I wasn’t fat at all. I was very muscular. (...) They said a lot of things...I didn’t like what they told me. For a while, it made me react, but then later, not any more... not at all. Finally, I said to myself: “What they tell you is useless. Work more, work more!” All they wanted, all they wanted was to make me cry. But it didn’t work. It helped me commit more and more. (F2)

The role of the family mastery climate and the modeling effect of siblings were evident for female gymnasts throughout their careers, while these influences were only apparent in the early experiences for males. Finally, the influence of the sport process was mainly evident during the increased and total commitment years, because of the increasing role of competitive stakes.

The second higher-order theme, *Achievement goals*, included self-referenced goals (learning goals and perfectionism) and other-referenced goals (based on social comparison). For all the participants, self-referenced goals were perceived to develop throughout the career, thanks to the influence of the sport social environment, especially via the coach’s mastery motivational climate. This climate generally emphasized fun, personal progress, the hard work ethic and pleasant social interactions in the early experiences and increased commitment years.

Other gymnasts reported that a more controlling learning climate involving unpleasant social interactions (e.g., yelling, provoking, punishing) was created by the coaches and was perceived to help them adopt self-referenced goals in situations in which they were lacking of autonomy (e.g., boring or exhausting tasks; burnout or failure situations). Furthermore, the role of teammates through peer modeling was more apparent in the total commitment years, than in the previous periods. The role of the family’s mastery climate was evident throughout some females’ careers, while the modeling effect of siblings in the early experiences was reported by a few males. The sport process itself was also perceived to contribute to the development of learning goals and perfectionism in males in the increased and total commitment years.

Other-referenced goals (i.e., based on social comparison) were reported to develop differently for males and females. Details are provided in Table 1.

The third higher-order theme was *Persistence*. For both males and females, persistence was perceived to develop over time, mostly thanks to social support from the family, the coaches, and teammates, in the increased and total commitment years. In addition, the creation of a mastery motivational climate by the family or the coaches emphasizing the hard work ethic, progress and including advice about the gymnast’s career was also recog-

nized to contribute to males and females' persistence. However, controlling climates created by the coach or the family, involving unpleasant social interactions and pressure on the gymnast were also identified as important methods of influence, especially among females. Finally, persistence was also seen for a few gymnasts as a result of their individual development through the influence of genetics (e.g., "I think I was born like that, I was born to face ordeals, to struggle, to persist in training until I succeed. This is innate" (F8), or as a consequence of their maturity and of the sport process (e.g., "This is well known, sport is character-forming, it strengthens you, it teaches you to get over a failure and to carry on", M2).

Self-determination was the fourth higher-order theme. This category included intrinsic motivation which developed mainly in the early experiences, and introjected and identified regulation (Deci & Ryan, 1985) which developed more in the increased and total commitment years. For both males and females, intrinsic motivation was perceived to develop thanks to the coach's mastery climate emphasizing fun and supporting the gymnast's autonomy. For all the participants, introjected and identified regulation developed through different sources and methods of influence in the increased and total commitment years. Details of the sources and methods of influence are reported in Table I.

The fifth-order theme, *Self-confidence*, was cited by all male and female athletes, as an important psychological characteristic. Encouragement and social support from the family was perceived to influence the development of confidence during the early experiences and increased commitment years in males, and throughout the females' career. The role of the mastery motivational climate of the sport social environment (coach and teammates) was evident throughout the male and female gymnasts' career. However, the influence of controlling contexts involving unpleasant coach-athlete interactions only emerged in females' verbal reports, mainly during the increased and total commitment years. The role of the sport process and of positive competitive experiences was only mentioned for the increased commitment years by some of the female gymnasts, whereas it was reported by the majority of males as an important source of influence throughout their career.

Performance enhancement cognitive skills. Performance enhancement cognitive skills were depicted through five higher-order themes: (a) sport intelligence, (b) focusing, (c) imagery, (d) goal-setting, and (e) self-talk (see Table II). The first higher-order theme, *Sport intelligence* (Gould et al., 2002) which included performance self-analysis and positive management of failure was perceived to develop slightly differently in male and female gymnasts.

TABLE II
Performance Enhancement Cognitive Skills: Sources, Methods of Influence, and Main Periods of Development among Male and Female Elite Gymnasts

Cognitive Skills		Gender	Sources of Influence	Methods of Influence	Main Periods of Development
Sport intelligence	Performance self-analysis	Female [71%]	Sport social environment [71%]	Teaching or inciting the gymnast to analyze her activity (C)	Increased commitment Total commitment
			Sport process [71%]	Learning from competitive or training experiences	Increased commitment Total commitment
			Family [57%]	Teaching or inciting the gymnast to analyze her activity (F+M)	Throughout the career
				Providing encouragement or social support (S)	Throughout the career
			Individual development [42%]	Maturity	Throughout the career
		Male [100%]	Sport social environment [100%]	Teaching or inciting the gymnast to analyze his activity (C+T)	Throughout the career
				Learning from models (T)	Throughout the career
			Sport process [100%]	Learning from competitive or training experiences	Throughout the career
			Individual development [57%]	Maturity	Throughout the career
			Positive management of failure	Female [100%]	Family [71%]
Teaching how to regulate emotions and remain positive through goal setting (M)	Early experiences Increased commitment				
Sport social environment [42%]	Teaching how to regulate emotions and remain positive through goal setting (C)	Increased Commitment			
	Providing encouragement or social support (C+T)	Throughout the career			

Segue

Segue TABLE II

Cognitive Skills	Gender	Sources of Influence	Methods of Influence	Main Periods of Development
	Male [57%]	Sport process [71%]	Learning from competitive or training experiences	Throughout the career
		Family [14%]	Providing encouragement or social support (M)	Early experiences
		Sport social environment [14%]	Providing encouragement or social support (C)	Increased Commitment
		Individual development [14%]	Maturity	Throughout the career
Focusing	Female [100%]	Sport social environment [71%]	Teaching the gymnast how to regulate emotions and activation; how to maintain her attention (C+SPC)	Increased commitment Total commitment
			Creating a controlling climate involving unpleasant interactions with the gymnast (C)	Increased commitment Total commitment
		Family [42%]	Teaching the gymnast how to regulate emotions and activation; how to maintain her attention (M+S)	Increased commitment Total commitment
	Individual development [28%]	Maturity	Increased Commitment	
	Male [100%]	Sport process [71%]	Learning from competitive or training experiences	Throughout the career
		Individual development [42%]	Maturity	Throughout the career
Sport social environment [28%]		Teaching the gymnast how to regulate emotions and activation; how to maintain his attention (C)	Total commitment	

Segue

Segue TABLE II

Cognitive Skills	Gender	Sources of Influence	Methods of Influence	Main Periods of Development
Imagery	Female [100%]	Individual development [100%]	Maturity	Increased commitment Total commitment
		Sport social environment [28%]	Teaching visualization, self-modeling and relaxation (SCP)	Increased commitment Total commitment
Imagery (follow-up)	Female [100%] (follow-up)	Family [28%]	Teaching visualization and relaxation (F+M+S)	Throughout the career
		Male [100%]	Maturity	Throughout the career
	Sport social environment [42%]	Teaching visualization and relaxation (C)	Throughout the career	
		Learning from models (T)	Increased Commitment	
Sport process [42%]	Learning from competitive or training experiences	Throughout the career		
Goal-setting	Female [100%]	Sport social environment [71%]	Creating a context supporting the gymnast's autonomy, including advice on the gymnast's career (C)	Increased commitment Total commitment
			Learning from models (T)	Total commitment
		Family [28%]	Creating a context supporting the gymnast's autonomy (M)	Increased Commitment
		Sport process [14%]	Learning from competitive or training experiences	Total commitment
	Individual development [14%]	Maturity	Increased Commitment	
	Male [100%]	Sport process [71%]	Learning from competitive or training experiences	Throughout the career

Segue

Segue TABLE II

Cognitive Skills	Gender	Sources of Influence	Methods of Influence	Main Periods of Development
		Sport social environment [42%]	Creating a context supporting the gymnast's autonomy (C)	Increased Commitment
			Learning from models (T)	Increased Commitment
Self-talk	Female [100%]	Individual development [100%]	Implicit learning	Increased commitment Total commitment
		Family [14%]	Inciting to use self-talk (M+S)	Increased Commitment
	Male [100%]	Individual development [100%]	Implicit learning	Increased commitment Total commitment
		Sport process [28%]	Learning from competitive or training experiences	Increased commitment Total commitment
		Sport social environment [28%]	Inciting to use self-talk (C)	Increased commitment Total commitment
			Learning from models (T)	Increased Commitment

Notes. The values listed next to the categories represent the percentage (%) of the sample of males and females; F: Father; M: Mother; S: Siblings; C: coach; T: teammates; SPC: Sport Psychology Consultant.

The influences of the sport social environment and of the sport process on self-analysis, were only evident in the increased and total commitment years among females, while these influences were apparent throughout the males' career. In addition, the advising and supporting roles of the family in the process of performance self-analysis were only evident for some females. Finally, individual development through maturity was perceived to contribute to the development of self-analysis in some males and females.

Positive management of failure was evoked by all the females, but only by half of the male gymnasts. Details related to this mental skill are provided in Table II.

The second higher-order theme referred to *Focusing*. Different sources (i.e., sport social environment, family, individual development, sport process) were perceived to influence the development of this psychological skill in elite gymnasts. For females, the teaching role of the sport social environment (i.e., the coach and the sport psychology consultant) and of the family was evident during the increased and total commitment years. More controlling contexts involving unpleasant coach-athlete interactions (i.e., pressure, yelling) were also identified as a method of influence of females' focusing, during these periods. For males, the roles of the sport process and of individual development were evident throughout the gymnasts' career:

- During competitions, before my turn and during my routine, I thought only of what I was going to do, and I did not think about anything else. I got used to it going from competition to competition. During competitions, just before my turn, I thought about everything I was going to do. (M3)

The third higher-order theme pertained to *Imagery*. For all the gymnasts, this cognitive skill mainly developed through individual experiences and maturity. The teaching role of the family was only evident throughout the females' careers. The teaching role of the coach and of the sport process appeared since the early experiences for males.

The fourth higher order theme was *Goal-setting*. This mental skill was described by all the participants, but the main sources and methods of influence appeared to be different among male and female gymnasts. The creation by the coach of a context supporting the gymnast's autonomy was identified as an important influence in females in the increased and total commitment years. The role of family context was only identified in a few females' early experiences. The modeling effect of teammates was apparent in the females' total commitment years and in the males' increased commitment years.

The role of the sport process was perceived as predominant throughout the males' careers, as apparent in the following quotation:

- At the beginning, I tackled competitions as they came, with no real particular goal. Now, we cannot afford to do that. Depending on my results, the goals I select, the way I train and er...I set precise goals. (M2)

The fifth higher order theme was for *self-talk*. All the participants perceived that this mental skill developed from the increased commitment years through implicit learning. The initiating role of the family was only mentioned by one female gymnast and the role of the sport social environment was identified in only a few male reports. Finally, a few males perceived the sport process contributed to the development of their self-talk, as this gymnast explained:

As you gain competition experience, you analyze your performance more accurately. By analyzing, you repeat words in your head, you talk to yourself. (M7)

Affective and psychosomatic skills. Affective and psychosomatic skills were defined through five higher-order themes: (a) ability to deal with anxiety and fear, (b) ability to deal with social pressures, (c) pain tolerance, (d) relaxation, and (e) activation (see Table 3). The first higher-order theme, *Ability to deal with anxiety and fear* was comprised of raw data responses pertaining to competitive settings, or to training and injury experiences. The teaching and supportive roles of the sport social environment were apparent for both females and males since the early experiences. The role of more controlling contexts involving unpleasant social interactions and pressure was also identified in the increased and total commitment years. These were seen as indirect methods influencing the ability to deal with anxiety and fear, as evidenced in the following quotation:

It was a difficult time when we learnt hard tricks. We were afraid. We were getting yelled at to get over our fear. It was strange. But sometimes we needed that to get over fear and try a new difficult skill. (F3)

Social support and psychological advice from the family were apparent throughout the females' careers. The roles of the sport process and individual development were more evident in males' verbalizations.

Ability to deal with social pressure was the second higher order theme and was comprised of raw data dealing with the negative influence of the social environment of the gymnast. Controlling contexts involving unpleasant social interactions with the coach or teammates were perceived to help develop the ability to deal with social pressure (e.g., avoidance of

TABLE III
Affective and Psychosomatic Skills: Sources, Methods of Influence, and Main Periods of Development among Male and Female Elite Gymnasts

Affective and Psychosomatic Skills	Gender	Sources of Influence	Methods of Influence	Main Periods of Development	
Ability to deal with anxiety and fear	Female [100%]	Sport social environment [100%]	Providing encouragement or social support (C+T)	Throughout the career	
			Teaching skills to relax and regulate emotions (C+T+SPC)	Increased commitment Total commitment	
			Creating a mastery motivational climate (C)	Throughout the career	
			Creating a controlling context involving unpleasant interactions with the gymnast (C)	Increased commitment Total commitment	
			Learning from models (T)	Increased commitment Total commitment	
			Family [71%]	Providing encouragement or social support (F+M+S)	Throughout the career
	Male [100%]	Sport social environment [100%]	Teaching skills to relax and regulate emotions (M+S)	Throughout the career	
			Creating a mastery motivational climate (F+M)	Throughout the career	
			Sport process [28%]	Learning from competitive or training experiences	Increased commitment Total commitment
			Individual development [14%]	Maturity	Increased commitment Total commitment
			Teaching skills to relax and regulate emotions (C+T)	Throughout the career	
			Providing encouragement or social support (C+T)	Throughout the career	
Creating a controlling context involving unpleasant interactions with the gymnast (C)	Increased commitment Total commitment				

Segue

Segue TABLE III

Affective and Psychosomatic Skills	Gender	Sources of Influence	Methods of Influence	Main Periods of Development
		Sport process [71%]	Learning from competitive or training experiences	Throughout the career
		Individual development [42%]	Maturity	Throughout the career
		Family [14%]	Providing encouragement or social support (F+M)	Increased Commitment
			Teaching skills to relax and regulate emotions (M+S)	Increased Commitment
Ability to deal with social pressure	Female [100%]	Sport social environment [71%]	Creating a controlling context involving unpleasant interactions with the gymnast (T+C)	Increased commitment Total commitment
		Family [42%]	Creating a controlling context involving unpleasant interactions with the gymnast (F)	Increased commitment Total commitment
		Individual development [28%]	Maturity	Increased commitment Total commitment
	Male [57%]	Sport social environment [100%]	Creating a controlling context involving unpleasant interactions with the gymnast (T)	Increased commitment Total commitment
Pain tolerance	Female [100%]	Sport process [71%]	Learning from competitive or training experiences	Increased commitment Total commitment
		Sport social environment [71%]	Creating a controlling context involving an increase of the training load and unpleasant interactions with the gymnast (C)	Increased commitment Total commitment
			Teaching relaxation and cognitive strategies (C)	Increased commitment Total commitment

Segue

Segue TABLE III

Affective and Psychosomatic Skills	Gender	Sources of Influence	Methods of Influence	Main Periods of Development
			Providing encouragement or social support (T)	Increased commitment Total commitment
		Family [28%]	Providing encouragement or social support (F+M)	Increased commitment Total commitment
		Individual development [14%]	Maturity	Total commitment
Pain tolerance (follow-up)	Male [57%]	Sport process [100%]	Learning from competitive or training experiences	Increased commitment Total commitment
		Sport social environment [57%]	Creating a controlling context involving an increase of the training load and unpleasant interactions with the gymnast (C)	Total commitment
Relaxation	Female [85%]	Sport social environment [100%]	Teaching breathing and relaxation techniques (C+SPC)	Increased commitment
	Male [71%]	Sport social environment [71%]	Teaching breathing and relaxation techniques (C)	Total commitment
		Sport process [42%]	Learning from competitive or training experiences	Throughout the career
		Individual development [28%]	Maturity	Throughout the career
Activation	Female [71%]	Individual development [100%]	Maturity	Increased commitment
	Male [71%]	Sport process [71%]	Learning from competitive or training experiences	Throughout the career
		Individual development [28%]	Maturity	Increased commitment Total commitment

Notes. The values listed next to the categories represent the percentage (%) of the sample of males and females; F: father; M: mother; S: siblings; C: coach; T: teammates; SPC: Sport Psychology Consultant.

bullying behaviors from older gymnasts) since the increased commitment years.

Ability to deal with social pressure from the family was identified for some females in the increased and total commitment years, as illustrated in the following:

My mum wanted me to succeed and to win competitions so much that she put a huge pressure on me. She told me to think of this and not to forget it. It was so much that I was more anxious than her about the competition. One day, I blew my top and I spoke to her frankly. I said that she should shut up or shouldn't come anymore. She didn't take it very well at the time, but after that it was better for everybody. (F5)

This ability was also perceived to develop with maturity in a few female gymnasts.

The third higher order theme was *Pain tolerance* and was evoked by all the female gymnasts, but only by half of the male participants. The sport process and the sport social environment were the main sources of influence in the increased and total commitment years. Specifically, the role of controlling contexts involving unpleasant social interactions with the coach and the demands of elite sport were identified in male and female interviews, as shown in the following statement:

When we practice gymnastics, we always hurt somewhere, but we have to cope with that, we have no choice. Otherwise, we are kicked out; finally it depends on how much it hurts, too. When it hurts too much, either we don't continue, we avoid doing the figure which is painful. Or if it hurts just a little, we do it anyway. (M4)

The supporting role of the family and of teammates in the increased and total commitment years was only cited by a few females.

The fourth higher order theme was *relaxation*. From the increased commitment years, females learnt how to relax with the help of their coach's teaching or with that of a sport psychology consultant. For some males, the role of the coach was evident in the total commitment years, while the influence of the sport process and of individual development was apparent throughout their careers.

The fifth higher order theme was *activation*. In female gymnasts, activation appeared to develop thanks to maturity mainly during the increased commitment years. In male gymnasts, *activation* was perceived to develop throughout the career via the sport process particularly via the competitions and to a less extent via individual development. The quote below illustrates such influences:

- Just before performing your routine you need to be in a particular state: not too anxious, sufficiently alert, not over active, not too relaxed. It's not easy to find the ideal state which allows you to be on top. The only solution is to compete, to compete a lot, to reach that state, to learn about you, to learn how to get into the perfect state. (M3)

Discussion

The purpose of the present study was to identify psychological characteristics developed by male and female elite gymnasts and to point out sources and methods of influence of the development of these psychological characteristics. This discussion is organized into three sections. The first section aims at discussing the main categories pertaining to developing psychological characteristics in relation to previous research. The second section displays similarities and differences in developing psychological characteristics among the female and male gymnasts of the present study. The third section considers the study's limitations and its implications.

PSYCHOLOGICAL CHARACTERISTIC DEVELOPMENT IN ELITE GYMNASTS

The results of this study highlight that elite gymnasts perceived they developed three main categories of psychological characteristics and mental abilities throughout their career: motivational characteristics, performance enhancement cognitive skills, and affective and psychosomatic skills. The psychological characteristics that were identified are in line with the research literature. For instance, Williams and Krane (2001) reported that the psychological characteristics of highly successful athletes included high determination and commitment, high confidence, concentration, self-regulation of arousal, positive imagery, and self-talk. Gould et al. (2002) confirmed that these components were critical to reach athletic excellence. Our results also confirm that specific characteristics or skills such as perfectionism, sport intelligence, pain tolerance, and the ability to deal with social pressure, similarly identified by Gould et al. among outstanding adult athletes, develop early among adolescent gymnastics champions.

The sources of development of these psychological characteristics included the gymnast's sport social environment, his or her family, individual development, and the sport process. These results are consistent with most of those of Gould et al. (2002), except for the influence of the community, which

did not emerge from our analysis. Also contrary to Gould et al.'s (2002) study, the role of sport psychology consultants was not identified as a major source of influence. This lack of sport psychology consultant influence could be explained by the fact that sport psychology still finds little recognition in the participants' culture, and that national sport teams are slow or reluctant in asking for such services, especially in gymnastics (Calmels et al., 2003).

Overall, the identified sources of psychological development among elite gymnasts show the predominant influence of significant others throughout the athlete's career, and support existing research (e.g., Gould et al., 2002; Morgan-Lynn & Giacobbi, 2006). Although our research confirms that coaches and parents fulfill different roles in the development of elite athletes, and that these roles tend to change over time (Weiss & Weiss, 2007; Wolfenden & Holt, 2005), our findings also show that teammates play an increasing role as the child matures, and that the family stays a central source of emotional support for female gymnasts. Our results also support the idea that individual development through deliberate practice (i.e., a long and strong commitment to improving performance) (Ericsson, Kramp, & Tesch-Römer, 1993) and natural learning experiences pertaining to the sport process (Calmels et al., 2003; Hanton & Jones, 1999; Morgan-Lynn & Giacobbi, 2006) are important contributors to the psychology of athletic excellence.

Different methods of influence were found to contribute to the psychological development of the gymnasts. Consistent with Gould et al.'s (2002) findings, some of these methods were perceived to have direct favorable consequences on the development of a gymnast's psychological characteristics, while other methods were perceived to have an indirect influence. Many of the direct methods of influence (e.g., providing encouragement or social support, creating a mastery motivational climate, encouraging athletes to set goals, to use imagery or to use self-talk, teaching athletes how to control emotions) parallel those described by Gould et al. (2002). However, specific methods of indirect influence such as interacting unpleasantly with the gymnast (i.e., teasing, provoking, threatening, reprimanding, insulting, constraining, punishing), increasing the training load (coach) or making financial or professional sacrifices (parents) were also identified in the gymnasts' verbalizations. These methods, which do not conform to theory and practice reported in the sport psychology literature (e.g., Singer, Hausenblas, & Janelle, 2001; Weinberg & Gould, 1995; Weiss, 2004), indirectly created favorable conditions and psychological environments for the development of motivational characteristics, focusing or pain tolerance.

Optimal motivational climates in educational settings based on achievement goal (Nicholls, 1984; Ames, 1992) or self-determination (Deci & Ryan, 1985; Pelletier & Vallerand, 1996) theories generally emphasize self-referenced standards of comparison (i.e., mastery climate), support of autonomy (i.e., encouraging the individual to make his or her own choices), and individual time and progress. Our findings suggest that elite sport contexts differ from educational settings for several reasons. First, social comparison is inherent to the sport process: it is part of the structural and social nature of the game (see Harwood & Swain, 2001). Because of financial or personal stakes, competition and winning have an important meaning for elite athletes and their coaches and time pressure and deadlines have to be considered (e.g., Calmels et al., 2003). These contextual factors could explain why more controlling learning climates involving unpleasant coach-athlete interactions (i.e., pressuring the gymnast toward a specific activity or particular outcomes; using threats or deadlines) appeared as required behaviors. These behaviors were deemed to help the gymnasts adopt adaptive patterns in particular situations in which they were lacking of autonomy (e.g., boring or exhausting tasks; burnout or failure situations). This would be consistent with the idea that situational external regulation (Deci & Ryan, 1985) may be effective for stimulating intensity and effort in achievement situations, as recently outlined by Garcia Bengoechea and Streaun (2007).

These results could also be discussed in light of the leadership style literature (e.g., Chelladurai, 1993) and the concept of the coach's 'required behavior' (i.e., adapted to the situational characteristics but not systematically preferred by the athlete). Similar behaviors have been identified in the study of coach-athlete interactions in elite female judo (d'Arripe-Longueville, Fournier, & Dubois, 1998). This study suggested the influence of the culture of the sport which emphasizes specific coaching styles. Together, these results suggest that specific psychological characteristics and mental skills required by athletic excellence might be developed in difficult and uncomfortable situations and through unpleasant athlete-coach interactions.

SIMILARITIES AND DIFFERENCES IN DEVELOPING PSYCHOLOGICAL CHARACTERISTICS AMONG FEMALE AND MALE GYMNASTS

The data relating to the female and male gymnasts revealed some similarities in the influences on the participants' development of psychological characteristic. In line with the existing literature (Gould et al., 2002), all

the gymnasts developed a set of similar psychological characteristics to reach athletic excellence. For example, commitment and effort to succeed, achievement goals, and persistence were emphasized by both male and female gymnasts. These characteristics developed throughout the gymnasts' career and were mainly linked to the combined influences of the sport process and of the social environment (i.e., the motivational climates created by the family, the coach and teammates). The role of controlling contexts on motivational variables and pain tolerance in the total commitment years was emphasized by both male and female gymnasts. Additionally, the ability to deal with anxiety and fear in competition developed mainly in the early experiences, and was related to the teaching and supporting role of the sport social environment among all the participants. Although different sources and methods were perceived to influence the development of imagery and self-talk throughout male and female gymnasts' career, the role of individual development through maturity or implicit learning was evident for all the participants. These results support and add interesting information to the existing literature (Gould et al., 2002; Harwood & Swain, 2001; Krane, Greenleaf, & Snow, 1997; Wolfenden & Holt, 2005).

Beyond these similarities, differences in the development of psychological characteristics of the male and female gymnasts were suggested. The main psychological characteristics were mentioned by both males and females. However, only half of male gymnasts identified positive management of failure, ability to deal with anxiety or fear in training or after injury, ability to deal with social pressure, and pain tolerance, while all the female gymnasts spoke of these psychological characteristics. Differences in the sources, methods of influence and main periods of gymnasts' psychological characteristics development were also suggested. Although the influence of the sport social environment was evident for both males and females, the role of the sport process was often predominant for male gymnasts as early as the early experiences, whilst the family influence was a constant throughout the females' career. For example, the role of the family was evident in the development of self-referenced goals and commitment, positive management of failure and ability to deal with anxiety and fear throughout the females' careers, but this role was only apparent in the early experiences for males. Thus, emotional and social support from the family was a constant in females, while parents were less important for male gymnasts as the gymnasts aged (Bloom, 1985; Wolfenden & Holt, 2005). In addition, in males, the role of the sport process was apparent since the early experiences, in the development of several psychological characteristics such as other-referenced

goals, self-confidence, goal-setting, ability to deal with anxiety and fear, and activation. These influences were perceived to emerge later (i.e. in the increased or total commitment years) in the female gymnasts.

To develop similar psychological characteristics, males and females can sometimes be receptive to different sources and methods, and/or significant others can behave differently with males and females. According to contemporary social cognitive theories of gender role development (Bussey & Bandura, 1999; Eccles, Freedman-Doan, Frome, Jacobs, & Yoon, 2000), differences in the socialization modes of boys and girls can be proposed. For instance, parents seem to play an active role in setting the course of their children's gender development by structuring, modeling, labeling and reacting evaluatively to gender-linked conduct. Thus, parental conversations take different forms for sons and daughters. Not only do mothers talk more to their daughters than to their sons, but they use more supportive forms of speech and include more emotional references with their daughters than with their sons (Flannagan & Perese, 1998). In addition, they are more likely to encourage daughters when they make affiliated and supportive remarks to others (Leaper, Anderson, & Sanders, 1998). In contrast, mothers are more likely to encourage autonomy and independence in their sons than in their daughters (Pomerantz & Ruble, 1998). Influence of the peer group with the gendered relationships which become established, the influence of the media and educational practices are also partly responsible for gender differentiation (Bussey & Bandura, 1999), and may explain why male and female participants of the present study perceived their psychological characteristics as developing in different ways.

LIMITATIONS OF THE STUDY AND IMPLICATIONS

This study presents a number of methodological limitations. First, the methods of analysis did not allow direct causality to be established, nor was the study truly longitudinal. Only seven elite female gymnasts and seven male gymnasts were interviewed, which constrains the generalization of the findings. Secondly, although the interview guide was based on descriptive questions, only gymnasts were interviewed, which might have generated a partial version of what had really occurred. Interviewing significant others and coaches, similarly to other researchers (e.g., Gould et al., 2002; Morgan-Lynn & Giacobbi, 2006; Wolfenden & Holt, 2005) would enhance the vision of the development of psychological characteristics in elite sport in future research.

Despite these limitations, this study presents some practical implications for coaches in charge of gymnasts. First, it informs coaches about the psychological characteristics necessary for elite training, and makes them more aware of the prime importance of psychological skills training during the early experiences. Secondly, because of the strong influence of the family and of teammates on the gymnast's psychological development throughout his/her career, there is a need for the coach to better consider the athlete's socialization network. Third, the study suggested that controlling contexts were sometimes required to help adopt adaptive patterns in case of time pressure, competitive demands or lack of autonomy. Such behaviors, which do not conform to those emphasized by contemporary motivation theories and practice, need to be considered with caution and discussed in their contexts of emergence. Finally, the results of this study suggest the necessity to reflect on the types of interaction that would best stimulate athletes according to their gender. Parents and coaches could support their athletes more effectively by becoming aware of the types of social influences and sources of psychological development to which they react or are sensitive to.

To conclude, the elite gymnasts of the present study were characterized by: a high level of achievement motivation; performance enhancement cognitive skills such as focusing, imagery, goal-setting and self-talk, as well as psychosomatic skills such as the ability to deal with anxiety or fear in competition. Positive management of failure, ability to deal with anxiety (in training or after injury), ability to deal with social pressure, and pain tolerance were specifically apparent in females. For each athlete, these psychological characteristics were perceived to develop over time through a unique combination of different social and personal sources, through direct and indirect methods of influence including unpleasant social interactions. The present qualitative study also suggests that the development of some psychological characteristics of elite athletes would depend upon gender, with males taking advantage of the sport process and competitive experiences, and females being constantly sensitive to family influence. Quantitative studies are now needed to ascertain that psychological characteristics develop differently in male and female athletes and identify how these differences may be related to the different socialization modes of boys and girls.

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