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A comparison of the developmental experiences of elite and sub-elite swimmers: similar developmental histories can lead to differences in performance level

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The current study fills a void in the literature that investigates the factors required for elite athlete development. Previous studies have (a) illustrated psychological and physiological differences between elites and non-elites; or (b) described the psychological and physiological developmental experiences of elite performers. The current study augments these research bases by obtaining the recollections of 15 highly accomplished swimmers (i.e. seven elite and eight sub-elite) and compares their developmental experiences. Qualitative results are presented within Bloom's (1985) stages of talent development (i.e. The Early, Middle and Late Years) and Hendry and Kloep's (2002) lifespan model of developmental challenges (i.e. Self-Efficacy, Social Resources, Structural Resources, Skills and Biological Dispositions) in order to present these athletes' idiosyncratic experiences in an organized manner. Similarities and differences among these athletes and between performance groups are presented, some of which are incongruent with current theories that address the developmental requirements of elite athletes. A discussion regarding the implications of these findings, and future research concerns, are then proffered.

Keywords: *Lifespan model of developmental challenge; Deliberate practice; Expertise; Talent; Athletes; Sport; Nature and nurture*

Research involving elite athletes has traditionally involved one of two approaches. In the first, current differences between high level and lesser performing athletes are addressed, which provides little understanding regarding how these performance differences developed. Empirical efforts emphasizing the second approach focus on the developmental experiences of elite athletes, and then attempts to generalize these findings, which does little or nothing to improve the understanding of how highly analogous developmental experiences among elites and sub-elites result in two

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The interview guide used in this study is available from the lead researcher upon request.

discrete group's differing performance levels. The current study builds upon, and links these two approaches by uncovering differences and similarities in the developmental experiences of elite and sub-elite athletes, based on in-depth interviews. Finally, the current study offers some preliminary thoughts regarding the meaningfulness of any idiosyncratic psychological differences resulting from these athletes' experiences, as well as other possibilities.

Psychological differences between successful and less successful athletes have been documented. Morgan (1978, 1980) identified an iceberg profile (i.e. high vigor, with lower levels of tension, depression, anger, fatigue and confusion) for higher performing athletes relative to lower performers using the Profile of Mood States (McNair *et al.*, 1971). Orlick and Partington (1988) found that successful athletes are able to focus attention, effectively image, set goals, commit to these goals, engage in competition simulation, prepare detailed competition plans, and implement distraction coping strategies in ways that are superior to those used by non-elite athletes. Smith *et al.* (1995) used the Athletic Coping Skills Inventory-28 to expose psychological skills differences among athletes of differing achievement levels, uncovering higher psychological skills scores for higher level performers. Gould *et al.* (1999) uncovered differences between successful and less successful US Olympic teams at the 1996 Olympic Games. Better performing teams consistently exhibited purposeful mental preparation, displayed high levels of focus and commitment, received support from friends and family, and had the opportunity to participate in residency programmes. Additionally, reports from elite distance runners show that they monitor internal states more closely and plan their races more meticulously than do novices (Masters & Ogles, 1998). Additionally, elite athletes have been found to be quicker and more efficacious in responding to environmental stimuli (Starkes *et al.*, 2001). Although research such as this is highly significant within the domain of sport psychology, it does not clarify whether the relationship between high performance and these psychological skills is causal or correlational.

Another line of research has provided insight into the developmental commonalities among elite performers. Bloom (1985) identified three stages of talent development: (a) The Early Years (i.e. initiation, up to age 10/11); (b) The Middle Years (i.e. development, ages 10/11–14 years); and (c) The Late Years (i.e. perfection, ages 14 and above). Côté (1999) proposed three distinct stages of sport participation: (a) sampling; (b) specializing; and (c) investment. These were very similar to the stages described in Bloom's model, however Côté placed an additional emphasis on the role of the family in each athlete's development. The theory of deliberate practice (Ericsson *et al.*, 1993) takes a different approach. Deliberate practice refers to those training parameters and activities that are engaged in specifically to improve an individual's performance. Essentially, the theory of deliberate practice espouses that any healthy individual whose development includes a sufficient number of hours of deliberate practice in a given field (i.e. about 10,000), can become an elite in that field (i.e. environmental factors account for almost all the variability in the pursuit of developing outstanding performance). A number of studies provide support for the factors emphasized by the theory of deliberate

practice in sport contexts. Helsen and colleagues (Helsen *et al.*, 2000; Helsen *et al.*, 1998) uncovered a positive linear relationship between practice time and skill level for soccer players and ice skaters. Starkes *et al.* (1996) reported a positive relationship between concentration and performance level. Moreover, Young (1998) provided evidence that deliberate practice factors play a salient role in the development of elite distance runners. The theory of deliberate practice and the stages of elite athlete development provide insight into the athletic progress of elite performers, but they do little to aide the understanding of the possibility that multiple individuals may have highly similar experiences, yet differ in their eventual athletic achievement.

The current study supplies insight into the athletic development of those who have and have not reached the pinnacle of sport achievement. This was done by interviewing both elite and sub-elite competitive swimmers. Athletes' idiosyncratic developmental experiences add to the current knowledge base regarding those factors that are potentially part of every athlete's development, and that may differentiate between achievement levels (e.g. elite or sub-elite). Hendry and Kloep's (2002) lifespan model of developmental challenges (LMDC) provides the framework within which these athletes' perspectives are presented. The LMDC proposes five factors (i.e. Self-Efficacy, Social Resources, Structural Resources, Skills and Biological Dispositions) that interact in a systemic manner and provide a way to understand the mental, emotional and behavioural mechanisms which people utilize to interact with the environment, with varying levels of success. Essentially, the LMDC proposes that individuals idiosyncratically manage life challenges in such a way that they proceed, stagnate, or regress. It is possible that elite athletes perform exceedingly well in their sport as a result of their responses to life's challenges. The LMDC is utilized in the current study as an organized means of addressing the inconsistent empirical conclusions involving: (a) greater intra-group than inter-group differences between elite and sub-elite athletes' development (Johnson *et al.*, 2006); (b) the generalization of elite athlete developmental stage theories (Bloom, 1985; Côté, 1999); and (c) the deliberate practice factors proffered as necessary and sufficient for the attainment of elite athletic performance. A number of studies have identified various factors salient to elite athletic performance. Mallett and Hanrahan (2004) found that several processes appear to be associated with elite track and field athletes including: (a) high motivation with personal goals; (b) high self-efficacy; and (c) sport being central to their lives; all three of which are components of the LMDC Self-Efficacy factor. The current study utilizes a qualitative methodology to compare the phenomenological experiences of elite and sub-elite athletes in a manner designed to improve the understanding of, not necessarily explain, elite athlete development.

Method

Selecting a participant base from the sport of swimming provides additional trustworthiness to the current study as competitive swimming is an individual sport consisting of clear and objective training and performance criteria among all

competitive disciplines and distances. In addition to the domain selected, further trustworthiness is found in the current study because independent data about each swimmer was also collected from each swimmer's parent and coach, allowing for deeper and richer insight into the developmental experiences of these athletes.

Participants

Participants became involved in this study via purposeful sampling. Initial participant recruitment occurred when the lead researcher contacted a coach of elite swimmers. This contact was based on a preexisting relationship between the two. After discussing the purpose of this study (i.e. to better understand the developmental experiences of high level swimmers), the coach recommended several athletes from his programme who were suitable for this study's purpose, thereby implementing a snowballing sampling strategy (Gall *et al.*, 2005). The remaining four training programmes that supplied participants became involved due to an elite swimmer responding to an email from the lead researcher that requested his or her participation in the study. Respondents to the email solicitation were telephoned to elaborate on the purpose of the study. In these cases the participating swimmer referred the lead researcher to his or her coach as well as to additional athletes within his or her programme, thereby furthering the purposeful sampling used in this research.

Participants in this study are all USA' citizens, Caucasian, and from middle or upper-middle class socioeconomic backgrounds. These last two identifiers are representative of competitive swimmers in the USA (USA Swimming, 2002). Each participant was provided with written participant expectations, protections, and a copy of a Human Subjects consent form. Participant specifics are described next.

Swimmers. A total of 15 swimmers participated in this study. Seven had objective competitive performances that were exceptionally high, and were therefore categorised as elite (i.e. three had earned at least one gold medal at an Olympic Games, two others had set at least one swimming World Record, and the remaining two were ranked in the top five in the world at the conclusion of more than one calendar year). This group was comprised of four males and three females who ranged in age from 21 to 28 years. Six were actively competing at the time of their interview. All of the elite swimmers were members of the US National Swimming Team for multiple years. The remaining eight participants were classified as sub-elite (i.e. these individuals had not achieved the elites' criteria, yet all had qualified for at least one US National Championship). There were six males and two females in the sub-elite group with ages ranging from 19 to 22 years. Additionally, at the time of publication only one of these athletes was actively competing. These 15 swimmers trained at one of five different programs located in a variety of geographic areas in the US.

This study's trustworthiness was further enhanced by including elite swimmers who were 'matched' with a sub-elite athlete at each training site (i.e. swimmers of differing achievement levels trained under the same coach), which improved the consistency of one salient environmental factor involved in athletic development; training opportunities, which is included in both the LMDC's Structural Resources and Social Resources.

Participant coding was done in the following manner: (a) The first character of each elite swimmer's code is an 'E', while those classified as sub-elite are denoted with an 'S'; (b) Each swimmer was then assigned a number between one and five, corresponding to her or his training site; and (c) Training sites with more than one elite and/or sub-elite swimmer also included a small letter 'a', 'b', or 'c', in order to differentiate among multiple elite or sub-elite athletes from a single site. For example, participant E5a is an elite swimmer from the fifth site, and there is more than one elite swimmer from that site.

Coaches. Five coaches, all males, were interviewed to aid the trustworthiness of this study's results. Coach interviews followed the same script as the athletes'. Although in some cases the coach participant was not aware of his athlete's early experiences, the data he provided allowed for an additional perspective regarding a large part of that swimmer's developmental experiences. Four of the swimmers in this study trained under the coach-interviewee throughout his or her *developmental and highest performing* phases. Nine of swimmers had trained with the coach who participated in this study during his or her *middle school and high school years*, while the remaining two swimmers were guided by the interviewed coach during *only their elite phase* of competition.

Parents. In order to further improve the trustworthiness of this research, a parent of all 15 swimmers was interviewed ($n=13$; one parent is the mother of the three swimmers at site 3). Parents provided additional insight into the athletes' developmental experiences and corroborated or refuted data from their child's interview. Parental interviews consisted of the same questions asked of the swimmer and the coach. Seven mothers and six fathers participated.

Interviewer. Due to the nature of the qualitative research process, this study's primary investigator is also considered a participant (Patton, 2002). This researcher conducted all 33 interviews (i.e. 15 swimmers, five coaches and 13 parents). He was a competitive swimmer and trained for two years with the coach at site 5, yet had no personal relationship with any of the other 32 participants. His first-hand knowledge of the sport of swimming and the training regimens employed therein is extremely high.

Procedures

A number of studies have relied on interviews to gather athletes' self-reported developmental experiences (e.g. Bloom, 1985; Ericsson *et al.*, 1993; Côté, 1999;

Durand-Bush & Salmela, 2002; Gould *et al.*, 2002). Each interview in the current study lasted from 50 to 105 minutes. An effort was made to interview the swimmer before interviewing his or her coach and parent in order to allow the second and third interviews to corroborate or refute what the swimmer reported. However, in five cases the coach was interviewed first, while in the remaining 10, the athlete was interviewed prior to his or her coach. In all cases the swimmer was interviewed before his or her parent. Each interview was audiotaped with prior consent, and then transcribed verbatim. These transcripts were provided to the interviewees, allowing them to make any changes they deemed necessary. In two cases changes were provided by the interviewee and were incorporated into the data analyzed in this study. These changes amounted to the rewording of five sentences.

The lead researcher has experience with: (a) coursework in qualitative research; and (b) qualitative journal article writing. His doctoral studies in counseling psychology and sport psychology included a dissertation that employed both quantitative and qualitative methods. Furthermore, his academic coursework, psychological practica, psychological internship, and practice as a (currently) provisionally licensed psychologist, have provided him extensive experience in asking questions and administering interviews in a manner that allow for rich responses from the interviewee.

Data collection and analysis

In addition to the benefits associated with including retrospective interview data in qualitative research, this study also minimised researcher bias. A structured interview guide was used within the context of a semi-structured interview procedure to enhance the accuracy and richness of the swimmer's subjectively recalled experiences. Parents' and coaches' comments and recollections about the swimmers' developmental experiences at home, during training, and in competition were used to triangulate and confirm/refute information obtained during interviews with the athletes in order to further strengthen the trustworthiness of this study (Patton, 2002).

Data collection. The interview guide used in this study was adapted (i.e. questions were specific to competitive swimming) from Côté's (1999) and Bloom's (1985) earlier research. Côté *et al.*, (2005) provide strong support for the strength of retrospective recall as a source of data in research such as the current study. The structured interview guide contained open-ended questions concerning three aspects of each swimmer's development: (a) Early activities (e.g. 'When you were young please describe your social interactions that occurred while participating in these activities', and 'When you encountered an enjoyable/challenging experience . . . , how did you deal with it?'); (b) development, maturation, and performance in swimming (e.g. 'Can you briefly describe your level of concentration and effort and what it felt like each year you were in swimming?' and 'How would you describe your training

through each developmental stage?'); and (c) development of relevant practice activities in swimming (e.g. 'I would like you to think of types of activities that were the most fun at the corresponding ages' and 'How well directed was your training program?').

The depth, richness, and authenticity of the participants' responses were improved via the interview techniques used. Three types of qualitative questions were employed in order to assure depth of participant responses: (a) open-ended main questions; (b) probe questions; and (c) follow-up questions (McMillan & Schumacher, 2006). Main questions constituted the structured interview guide and probe questions clarified responses to these questions. For example, the following was asked of the coach of E1, 'When (E1) came back from her shoulder surgeries you stated she initially had a hard time getting back into competition with great confidence. Please describe an example illustrating that' (i.e. please describe what you did or said and the resultant response). This question was not part of the interview script. It was asked in an effort to elicit additional depth and richness to both the coach's manner of dealing with his swimmers, and how E1 responded to both her coach and a challenging event in her life. Follow-up questions were asked in order to investigate new issues that arose during the interview process (i.e. to cull possible additional valuable information regarding swimmers' thought processes, affective responses, and behaviours that may have impacted their performance level).

Data analysis. A technical/quasi-statistical style of data analysis procedure (see Marshall & Rossman, 1999 for a review of this style) was used to examine the similarities and differences between the two groups of swimmers. Three investigators read and reread the verbatim interview transcripts. Meaning units were independently identified by each investigator and then organized by stage of talent development (e.g. The Early Years). Following this, data were organized into Hendry and Kloep's (2002) LMDC. In other words, each meaning unit was identified as being associated with an LMDC factor (e.g. Self-Efficacy) and was categorized by the athlete's age at the time of the experience. Table 1 shows this classification system in a concrete format. Not all categories in the LMDC were represented equally in the results section as often participants' statements could be interpreted as belonging to more than one category. Therefore, each statement was categorized as it best fit the LMDC model relative to the purpose of the current study.

Once all three researchers independently completed a full and thorough review of the data, the three compilations were compared and contrasted during group meetings. A total of 21 discrepancies arose and were discussed until a consensus was reached in order to achieve greater trustworthiness.

In summary, methodological considerations that strengthened this study's trustworthiness included: (a) triangulating the data by interviewing the swimmer, one of his or her parents, and the athlete's coach; (b) authenticating the interview transcripts via post-interview participant feedback; (c) using a structured interview guide that was valuable in previous studies (Bloom, 1985; Côté, 1999); (d)

Table 1. Bloom's (1985) stages of elite participant (e.g. athlete) development and the five factors of Hendry and Kloep's (2002) lifespan model of developmental challenge (LMDC)

| Stages of talent development | LMDC | |
|------------------------------|--------------|--|
| I | Early years | Self-Efficacy Social Resources Structural Resources Skills Biological Dispositions |
| II | Middle years | Self-Efficacy Social Resources Structural Resources Skills Biological Dispositions |
| III | Late years | Self-Efficacy Social Resources Structural Resources Skills Biological Dispositions |

comparing the developmental experiences of two easily differentiated groups of highly accomplished athletes; and (e) having the data reviewed by multiple researchers. An overview of the data is presented in the following results section.

Results

While supplying their subjectively interpreted experiences, the swimmers who participated in this study also provided descriptive data, which is delineated in Table 2. This includes the age each began competitive swimming, achieved state-national-international performances, decided to be an elite swimmer, and commenced non-swimming activities designed for the specific purpose of improving swimming performance. Identifying these developmental milestones provides additional insight into each swimmer's unique history. The participants' depictions of their developmental experiences are now presented in accordance with Bloom's taxonomy (1985) and begin with The Early Years. Additionally, the LMDC factor related to a participant's statement is also noted throughout this presentation. Often representative quotes are used as illustrations. Whenever an athlete's statement deviated from the majority such a divergence is noted.

Early years (ages up to ~10/11 years)

This first stage of talent development consisted of each athlete's introduction to sport involvement in general. Every participant reported being introduced to swimming in some manner during this first stage. Eleven of the swimmers reported beginning their structured competitive swimming careers during this stage while S1, S2, E5a and

Table 2. Swimmer identification information and achievement milestones

| Swimmer no. (and gender) | Age at which the swimmer: | | | |
|-----------------------------|----------------------------------|---|--------------------------------------|--|
| | Began competitive swimming | Achieved state, national, international performance | Decided to be an elite swimmer | Commenced non-swimming activities specifically to improve swimming |
| E1 (f) | 5 | 7, 12, 14 | 12 | 17 |
| E2a (f) | 8 | 12, 15, 17 | 17 | 15 |
| E2b (f) | 6 | 12, 13, 17 | 12 | 16 |
| E3 (m) | 7 | 15, 16, 20 | 16 | 13 |
| E4 (m) | 8 | 15, 20, 23 | 19 | 14 |
| E5a (m) | 15 | 18, 19, 22 | 18 | 14 |
| E5b (m) | 16 | 16, 18, 19 | 16 | 16 |
| S1 (f) | 11 | 11, 15, N/A | Did not | 15 |
| S2 (m) | 12 | N/A, N/A, N/A | Did not | 14 |
| S3a (m) | 6 | 14, 16, N/A | 16 | 13 |
| S3b (m) | 9 | 16, 18, N/A | 19 | 13 |
| S4 (m) | 7 | 16, 20, N/A | Did not | 14 |
| S5a (m) | 7 | 14, 17, N/A | 17 | 14 |
| S5b (m) | 7 | 15, 17, N/A | 17 | 15 |
| S5c (f) | 8 | 15, 17, N/A | 17 | 18 |

E5b stated they initiated their competitive swimming careers in either The Middle or Late Years.

According to Bloom (1985), during the Early Years of elite development, athletes view activities as more participatory, as opposed to outcome oriented. Additionally, interactions with adults are described as positive and supportive (i.e. LMDC Social Resources).

All of this study's participants reported involvement in multiple activities during The Early Years and they described this involvement, regardless of the specific sport, as enjoyable. Sample testimony provided by S1 permits insight into comments made by all 15 participants, 'I liked playing sports in the yard' (i.e. Self-Efficacy and Structural Resources). Furthermore, these 15 swimmers unanimously shared an interest in being active. The father of S1 provided a representative statement when he said, 'she's always been very active in playground at her school'.

Each athlete also spoke of an interest in doing well in sports at this young age. However, each verbalized short-term and only vague performance outcome, rather than specific 'break this world record', goals. E1 reported, 'I'd test anything, put anything to the limit' (e.g. Self-Efficacy and a possible Biological Disposition relative to her personality). However, some provided reflections demonstrating support for motivation due to rewards at work as exemplified by E2b who stated, '... but I really liked to get ribbons (at age 6), and they had a lot of ribbons for me, it was a big influence ...'.

During this first stage every athlete also acknowledged the integral role played by his or her parents and coach (i.e. Social and Structural Resources). Each confirmed

that his or her parents drove to practices and provided emotional support at this young age. E3 gave this representative quote:

They [my parents] were always very supportive and I think a big factor was them not getting too involved. They were supporting, but they were never really pressuring us growing up so we never really felt any obligations to swim fast or anything.

Additionally, at this young age the swimmers' coaches provided structure and a place to learn the sport and develop basic skills. S3a shared a common sentiment, '... (when I started at age 5 it was) kind of low key ... the practices didn't compare to club swimming. So around nine or 10 we joined the club team, started swimming over the winter' (i.e. Structural Resources). These last two reports (i.e. regarding parents and coach) may also reflect the possible importance of the athlete developing his or her sport interest and behaviours at an idiosyncratic rate.

None of the 11 participants who were swimming competitively at this age were identified as future elite swimmers during their Early Years by the adults in their lives. Comments from the coaches emphasized the importance of working towards the next level and did not include the end goal of a World Record or the Olympic Games (i.e. developing Self-Efficacy and Skills). E3, an Olympic Gold Medalist, was not a prominent youth performer. His coach provided insight that they did not focus on the development of outcome goals until long after E3's Early Years (e.g. in E3's case this occurred during his Late Years), which was congruent with the other four coaches who participated in this study. The statement from the Coach of E3 was:

We [E3 and coach] began to talk about it after his sophomore year [in high school]. He still really wasn't that good that winter. He was only 4:40/4:41 in the 500, and he was top six at the state high school meet, you know, that kind of thing. Not even a junior national qualifier yet.

During the Early Years these athletes were all physically active in their environments. The focus was more on participating and the process than on the outcome and the intensity of their experiences was not great. Parents and coaches were perceived as supportive and none of these athletes were identified as future elite swimmers. We now present results that illustrate these participants' experiences during the Middle Years.

Middle years (ages 10/11–14 years)

During the Middle Years, Bloom (1985) noted that elite performers: (a) increase the importance of a single sport in their lives; (b) decrease the number of activities they engage in; (c) change the type of training they employ; (d) shift their motivation; and (e) adjust the orientation of their interpersonal relationships. During this stage Bloom asserted that elite athletes tend to shift self-perceptions from 'one who swims' to 'a swimmer', which is a concept included within the LMDC factor of Self-Efficacy. Fourteen of this study's 15 swimmers provided support for this notion, the

exception being S5b who consistently made references to his 'playing baseball' and 'playing soccer'. E4 furnished a representative statement when he said:

I think that when I was really little, like probably 10/11, is when ... you know I was swimming every day, pretty much five days a week during the weekdays, so I think that's when I started looking at myself as a swimmer ... so people'd be like 'oh, you're that swimmer, aren't you?' And I'd be like 'yeah'.

S2 reported, 'definitely when I came back when I was 11, I considered myself a swimmer'. Based on this data many elite and sub-elite swimmers appeared to experience shifts in their self-identity during the Middle Years. However, E5a and E5b reported not having solidified their self-identities as swimmers by The Middle Years because both of these individuals were heavily involved in another sport, soccer and golf, respectively.

In addition to clarifying when each swimmer self-identified as 'an athlete', questions during the interview included (a) 'Identify the date when the *idea* of becoming an elite athlete first emerged'; and (b) 'Identify the date when the *decision* was made to become an elite athlete'. These were posed in order to better understand how these athletes perceived themselves in the world and when this thought process emerged, or if it ever did. This LMDC Self-Efficacy question elicited responses that were in agreement with and refuted Bloom's (1985) contention, as a wide range of ages were given in response to these questions independent of performance group. All three of the swimmers at site 3 commented that their shifts in self-perception occurred during their early to mid-teens. For example, E3 stated:

I think a big step was when I first made my national cut (at age 16). That kind of got the ball rolling. I was probably a little bit naïve, but I just kept focusing on what I had to do next and my coaches really, really did a good job helping me focus (i.e. Self-Efficacy, Social Resources, and Structural Resources).

Alternative responses were also forthcoming. S5b provided his account that his shift in self-efficacy occurred in his Late Years when he reported, 'I think I started noticing it senior year in high school when I made that big improvement and went down to 55.9. Just cause better colleges started recruiting me'. Additionally, E1 shared her interest in and feelings that future elite performance was possible from a very early age. She reported, '... and even as I got older into swimming (at age 8) I had a dream of being an Olympic swimmer'. E1's first international medal came as a bronze at the World Championships at age 14. Furthermore, some sub-elites were not able to provide definitive dates for when the idea of becoming, and the decision to become, an elite athlete emerged. For example, S1 provided dates for both, yet her coach and father independently reported during their interviews that, in their opinions, S1 never truly made the decision to become elite. S1's statement was, 'I remember ... it was actually (during) my freshman year (in high school) at states ...', while her father reported:

I think she recognized it when she got that top 16 (in the US for her 11–12 age-group) time in (Southeastern US state). But her coach just kept saying how good she was, and even parents of kids who saw her swim said she's special ... she had to know then that she was ... she could be elite, you know? When she consciously decided to go for it, as you say? This may be kind of weird, but I don't know if she ever did commit to that.

S1's coach independently concurred with the father when the coach stated:

That's something that I don't think she ever really decided she wanted to become, and ... there were decisions that she never really took a hold of and said 'this is what I really want to do'. I think she listened to me and other people say 'this is your ability', ... she never took a hold of that and said 'this is a commitment I'm going to make ... I want to be at the Olympic Trials, I want to make it to the next level'.

Bloom (1985) proposed that during The Middle Years future elites expand their motivation from a primarily intrinsic base to a more balanced combination of intrinsic and extrinsic (i.e. Self-Efficacy). All of the elite swimmers supplied comments reflecting high levels of motivation, while members of the sub-elite group reported both high and discernibly lower levels. Examples of this come from E2a who reported:

I'm a person that doesn't know times. I don't even know my best times. I don't really pay attention to that. I guess just winning, and doing what's best for my team, getting my hand on the wall. ... After I touch the wall, I get a feeling and I forget it.

and S3b who shared:

I think by the end of my eighth grade year I was offered the choice to move up into the next group and do morning practices. ... Basically, when that happened at that time I started devoting myself a lot more to swimming because much more was expected of me and I started having big goals for myself at that point.

However, S5b reported a much more limited level of motivation, 'I'd hide before (early morning) workout. My sister had to go, so if I'd hide long enough my mom wouldn't wait ...'

During this developmental stage all of the elite, and some of the sub-elite athletes, also began to exhibit abstract thinking patterns and use more sophisticated cognitive processes in order to achieve their long-term goals. Bloom (1985) noted that during this stage future elite athletes often changed coaches with the intent of receiving expert instruction and thereby facilitate future elite performance. Four of the elite swimmers and three of the sub-elites reported changing coaches at the beginning of their Middle Years with the specific goal of experiencing a more facilitative swimming environment. For example, E2b shared her thoughts regarding changing teams at age 11 as follows:

It was a lot bigger, and it helped me to see there were more things ... I got to see bigger swim meets you know, like Junior Olympics or whatever. I thought it was one step below the Olympics.

S2 reported, 'We just weren't satisfied with the team we were on ... wanted to go to a better team. It wasn't challenging and they didn't do any of the big meets'. S1 addressed her family's move from one state to another due to her father's employment and the factors involved in selecting a swim team to join:

Then we'd heard about (coach at site 1) during the '96 Olympics, that was when we were getting ready to move to (Southeastern US state). And my parents were like 'wow, here's this Olympic Gold Medalist and this coach right where we're going to be living'.

Eight of the swimmers who participated in this study (i.e. three elites and five sub-elites) did not change training programmes as: (a) two stated they were not competitive swimmers during The Middle Years; and (b) six reported that their current training programme provided them with an optimal training environment (i.e. Structural Resources).

The 13 participants who were competitive swimmers during their Middle Years also reported decreasing their non-swimming activities within this age range. Most stated they increased their time spent swimming (i.e. Structural Resources) with the goal of narrowing their athletic focus and thereby improving their swimming performance (i.e. Self-Efficacy). However, this was accomplished with varying degrees of commitment and coercion. E1 described her decision process as follows:

I just remember it got to the point where I was making my junior national cuts and wanting to pursue bigger things in swimming and I had one little accident on my bike in a triathlon (at age 13) and ... my coach didn't like, so he just kind of said 'it would be wise for you not to continue in that and focus on swimming'. I thought he was probably right.

Her teammate, S1, shared a slightly different experience with the same coach, 'He told me (at age 13) I would need to choose between other sports that I was involved in and swimming. So I chose swimming. It's very intimidating, first chat with (coach at site 1)'.

The relationships (i.e. Social Resources) these swimmers had with the adults in their lives also shifted during this stage. Parents typically increased their involvement, but did so primarily in a supportive role (e.g. driving to workouts). Additionally, this study's swimmers experienced discrete boundaries with their parents. E1 shared the following insight:

Sometimes they say comments and they think they know a little bit ... I think it's great. I would've been so aggravated if they had tried to get so technical into it, because that was my job and my coach's job.

In addition, during the Middle Years the coaches were acknowledged as highly directive for the first time, a quality that every swimmer in the study reported as desirable. Additionally, there was often a two-way dialogue between swimmer and coach. E4 acknowledged:

When I was younger I would have a good swim and then not so much, in practice. And so that frustrated me a lot. I also feel like everybody should train like I do and when they don't and then they get a 'good job' (from the coach) . . . I just don't feel it's real equal. I was very into my coach's compliments and what he said to me. But I remember also telling him to stop telling me I'm doing ok when I'm not.

The participants' reports of their Middle Years' experiences provide insight into a number of similarities in the developmental patterns of these elite and sub-elite swimmers, and the beginning of distinct differences among individuals. All but one of the sub-elites self-identified as 'an athlete' during this stage, but with differing levels of dedication as some sub-elites did not commit to reaching the highest performance levels. Motivation levels were also high in most of this study's participants, with the noticeable exception of a few of the sub-elites. Moreover, each of these participants increased their focus on athletics during this stage, but with varying degrees of internal drive (i.e. all of the elites and some of the sub-elites) and external coercion (i.e. a couple of the sub-elites). And finally, a common experience among all of these swimmers included relationships with adults (i.e. parents and coach) that included discrete boundaries. What happened during these athletes' Late Years is presented next.

Late years (ages 15 years and beyond)

The factors that were compared among the swimmers' Late Years included: (a) their level and type of focus, and their motivation level (i.e. LMDC Self-Efficacy factors); (b) their perceptions of relationships (i.e. Social Resources); and (c) their perceptions of their Structural Resources. Statements related to these factors dominated participants' responses to the interview questions related to The Late Years. The remaining two categories of the LMDC (i.e. Skills and Biological Predisposition) find inadequate data within the current study to perform an effective evaluation. Skills often refer to a behavioural component of human existence and the current study is investigating psychological differences. Additionally, genetic predispositions were not explicitly investigated in the current study (i.e. there is a lack of a section in this article that addresses Biological Predisposition).

Bloom (1985) identified that during The Late Years future elite athletes' lives revolved almost entirely around their athletic participation. All of this study's elite swimmers provided support for this assertion, as did three of the seven sub-elite swimmers (i.e. S3a, S3b and S5c). E1 and E3 provided statements about focus that provide insight into two very differing styles. E1 reported, 'I did what I had to do at school and I left. School was someplace to go between practices'. However, E3 stated, 'You come in (some days) and you're not feeling well, or if you had a bad day in school it's harder to focus. But I'd say most of the time I'm really focused and, you know, I'm giving 100%' (i.e. a reference to Structural Resources and Self-Efficacy, as well as an idiosyncratic relationship between the two).

E3's younger sibling, S3a, shared a stressful experience that reflected his level of enmeshment with (i.e. his focus on) his sport with the following:

The knee injury was a lot worse emotionally actually because I was so stressed out from being so close to getting my [Olympic Trials] cut and then I got the flu too and then that even stressed me out more and I thought 'time's running out, I'm not going to be able to get my trial cut'. And that was the main focus of my career up until that point.

A few of the sub-elites in this study, however, provided statements reflecting a lower level of focus. For example, S5a stated, 'I really just showed up, did what the coaches said, but really didn't put a whole lot in'. S5a also provided an account of his experiences during a regional competition during this stage:

... it was a pretty cool thing. It was the first time I had ever been there but I brought my water balloon launcher and we were firing it out the window of the hotel at people in parking lots across the street ...

E5b provides a unique case study, more so than others who participated in the current study, as he began competitive swimming as a sophomore in high school with three hourly workouts each week for 14 weeks a year. He stated that during his senior year he decided to join a year round swim club with the ultimate goal of improving his fitness, thereby aiding his chances of obtaining a university golf scholarship. Up until this time, golf was E5b's primary sport. He spoke of selecting a proven expert swimming coach, and after a few months of excelling at swimming he decided to put his golf career on hold. He went on to swim on the US National Swimming Team after 18 months in the sport, and, after 30 months he was an Olympic Gold Medalist and World Record holder. He provided evidence of a number of behaviours, cognitions, and affective tendencies that may have contributed in a systemic fashion to his unique ascension. The following excerpts from his interview provide examples of this:

[up until my senior year in high school] I was pretty much doing half of what they were doing. Like, girls were swimming circles around me. You know, but I still had the ability to get up and race pretty competitive ... it felt like a challenge and I always wanted to be pushed and stuff ... I felt like I was more focused and intense. That's where I felt like I had a competitive edge ... Like worth fighting over ... every time I get in something, like I haven't really been into golf or anything and I plan on making the [PGA] tour ... I've always believed that whatever it is I'll find a way to squeak out a little something else ... those guys at that level are ... there for a reason. They didn't just show up ... I don't care who they are. I deserve to be there just as much if not more.

His father and his coach also provided some insight into E5b's highly intense focus, as the following examples illustrate. E5b's father reported:

... when he was being recruited (for college swimming), I took him down to a trip. ... The thing I won't forget was, (E5b) said to the university coach, 'I want to

know when I am going to train for that Olympic team, and make the team, how is that going to impact what I do at (Eastern US university)?

Additionally, the coach at site 5 shared:

[E5b] always was prepared to race and do his best and tolerate nothing but that in his attempt to win—no question about it, during both practices and competitions. . . . There was pressure every minute that I coached him after he reached an international level to make sure that the challenges were always part and parcel of his daily workout. And certainly that was his attitude/approach that he would challenge anybody who was working with him to be better.

Clearly, E5b provides an example of a swimmer who, during his Late Years, was highly focused and had a high level of self-efficacy.

Many of these athletes also identified a shift in their training focus during the Late Years. E3 reported that his training emphasis shifted from an ‘aerobic distance-based, quantity focus’ to more of a ‘quality, race-specific focus’. Additionally, E1 acknowledged how her training focus shifted over the course of her career and why with:

At 9 or 10 years old my coach could give me any amount of yardage, and I could come back later that afternoon or the next day and be fine. Not an ache, not a pain, nothing. And now [at age 24] it’s like by the end of the week I am so dead sometimes [that] a day and a half isn’t even enough for me to recover.

During Bloom’s (1985) Late Years elite performers exhibit high levels of intrinsic motivation and the ability to work through life challenges, which is another Self-Efficacy factor in the LMDC, and the second major construct discussed in these athletes’ Late Years. Everything that could possibly facilitate the perfect race and enhance the elite performers’ achievement was incorporated into the individual’s life during this stage. Some of the swimmers in the current study were able to verbalize vivid and specific instances when they realized that they were not behaving in a manner conducive to achieving this and then instituted a remedy. For example, E2a described an experience during an international competition with the US National Swimming Team exemplifying this point. She stated that while competing in Europe she was soundly defeated in a race in Italy, getting fifth in her specialty. She described what happened after this race as follows:

In Paris (three days after the Italy race), this kid was 3rd in the 100 fly . . . and he looked at me after those awful swims in Italy and he just said . . . ‘you’re scared of winning’. It just smacked me in the face that I was . . . He said he went through it. . . . He’s like ‘there is nothing to be scared of’. I guess it’s just being scared of not knowing what’s next, or whatever this fear was. It was stopping me from being as good as I could’ve been. That was the turning point when I decided I was going to [US Olympic] Trials and winning.

Five days later E2a raced in Paris and won, coming within a tenth of a second of the American Record.

Another cognitive and affective coping style was reported by E1, ‘... I know there are people out there guessing what I can do this summer, and that just gives me an extra edge. It lights a fire under me’. Of the sub-elite swimmers only S3a, S3b, and S5c provided evidence of similar efficacious coping styles, while all seven elite athletes provided these types of statements.

All of the elite swimmers reported consistently elevated levels of motivation and an internal locus relative to perceptions of a facilitative environment (i.e. an interaction among their Self-Efficacy and Structural Resources). However, these were not clearly differentiating factors between the elite swimmers and the sub-elites, as some members of the latter group exhibited tendencies highly similar to the elite athletes. For example S1 reported:

At (Conference) I didn’t swim well. The next week the guys had (Conference) ... since coaches were at guys’ (Conference) we were on our own and our coaches were emailing us practices to do, but I was like ‘I’m not going to do that’. So I kind of did my own practice and I swam so much faster than I did at (Conference) ... the week before.

S5c shared her perspective relative to this factor as follows:

I never ever thought about it, like ok, here we go, let’s work hard on this set. I’m just that competitive that I’m not going to let someone next to me beat me. I’m like, ok, this is mine, and I know I’m faster than you, I’m going to beat you.

Results involving comments about the Social and Structural Resources available to these swimmers were also collected to assess any subjective differences between elite and sub-elite athletes. Each swimmer acknowledged that his or her coach was knowledgeable, capable, and qualified as a coach of elite athletes. S1 stated, ‘I could always go to him anytime I wanted. He was an excellent coach’. In addition to being technically supportive (i.e. an interaction among the LMDC factors Social Resources, Structural Resources, and Skills) E5a shared an example of his college coach being personally supportive. E5a self-identified as not being accomplished enough to be heavily recruited by colleges during his senior year in high school. He stated, ‘I was a good kid. I did well in school. I had a good family history. So (college coach) was just like, ‘well I’ll give you a shot’’. S4 provided insight into himself, his coach, and their relationship when he reported:

He (coach at site 4) demoted me down to another group to train in that summer. I trained with (an assistant coach at site 4), a distance coach. That happened my junior and senior year of high school. I wanted to swim with (coach at site 4), but only when I wanted to show up, and he didn’t let me do that, so I was fine in the other group. Do it for fun, not take it so seriously all the time.

S5b shared an example of less than efficacious Social Resources in his life:

My dad was really the one against waking up in the morning, that’s why I switched over to (coach of site 5)’s group [at age 16]. He still has mornings, but his primary

practice was in the afternoon. He has morning practices Monday-Wednesday-Friday, and I was able to talk him out of me having to go.

Athletes' perceptions of their parents, and the parents' role in their development, were also culled from these interviews. The coach at site 3 provided his perceptions of the positive family environment experienced by the three siblings who participated in this study, with the following:

Especially with all three of the boys going to NCAAs this year and stuff, if it was gone tomorrow I think they'd be the exact same people as they are just because of the family, and I think that's one of the reasons they've gotten as good as they are.

Additionally, Bloom's (1985) reports cited family activities, such as vacations, began to revolve around the sport during The Late Years. The mother of E3, S3a and S3b succinctly stated this when she said, 'Our family vacations seemed to center around swim meets'.

Data from this study regarding The Late Years provides support for elite athletes possessing extraordinarily high levels of focus and motivation. However, it was also evident that almost half of the sub-elites possessed similar levels of these constructs. Furthermore, all 15 athletes identified their coach as very qualified to work with the best athletes in the world. Additionally, Social Resources in these swimmers' lives appeared to be positive, if not facilitative for all (i.e. some of the sub-elites). However, this commonality cannot be construed as analogous among participants. Every athlete described an idiosyncratic pattern of interactions between the swimmer and the parents. Furthermore, family interactions appeared to be positive and consistent to some degree (e.g. sport being central to the family's functioning at some level), but some family behaviours were facilitative while others likely inhibited elite level athletic performance (e.g. parent not wanting to get up to drive child to morning workouts).

A discussion regarding the possible implications of these results follows. Considerations for future research in the area of elite athletic performance are also offered.

Discussion

When analyzing these 15 swimmers' interviews it is apparent that, although achievements may have differed at younger ages, the elite athletes and three of the sub-elites provided evidence of highly homogeneous developmental experiences and perceptions that are congruent with Bloom's (1985) and Côté's (1999) research, with minor discrepancies (e.g. age when deciding to become an elite athlete). Additionally, these 10 appeared to systemically organize their behavioural strategies and effort. However, similar coping strategies and subjective environmental perceptions were evidenced by the elite swimmers and participants S3a, S3b and S5c. These 10 athletes developed high levels of self-efficacy, had facilitative social and structural resources, and exemplified high skill levels. The fifth and final LMDC

factor, Biological Dispositions, was not directly tested in the current study. Nevertheless, if an athlete: (a) possesses elevated self-efficacy; (b) has supportive family, friends and teammates (e.g. as evidenced by the three brothers at site 3); (c) has helpful structural resources (e.g. as supported by the matched-pair methodology employed by this study); and (d) has proven superior skills (e.g. as substantiated by the high performance level of the sub-elites who participated in this study); then there must be (a) some other factor that plays a role in the development of elite achievement; (b) an interaction among the first four LMDC factors that was not measured during the current study; or (c) some combination of (a) and (b).

Furthermore, E5a and E5b provide additional lines of evidence that the path to elite swimming performance can be highly unique. These two athletes' experiences differed significantly from those who participated in Bloom's (1985) and Côté's (1999) earlier research, as well as the other five elite athletes who participated in the current study. For example, E5b engaged in far less than 10,000 hours or 10 years of deliberate practice, which Ericsson and colleagues (Ericsson *et al.*, 1993; Ericsson & Lehman, 1996) assert to be necessary prior to achieving world record performances. However, his focus on and commitment to his sport were reported to be extremely high. When coupled with recent research by Baker (2003) and Johnson *et al.* (2006), it becomes apparent that incorporating a specific physical training regimen and experiencing a specific athletic developmental history from a young age does not necessarily lead to elite sport performance.

Recently, Marsh and Perry (2005) uncovered a relationship between elite swimmers' self-concept and their performances at the 2002 Pan Pacific Championships, even after statistically controlling for previous best performance. Baker and Côté (2003) identified that gifted athletes need adequate social and structural resources, and high motivation in order to develop superior performance. Furthermore, Baker and Horton (2004) argue that two *influences* are required for elite sport performance to be realized: primary (i.e. genetics, training and psychological factors) and secondary (i.e. socio-cultural factors and context). Support for all of these, with the exception of an explicit measure of genetics, was found in the current study. That is, at least 10 of the participants provided evidence of having facilitative experiences relative to each of these factors, yet three of these 10 are sub-elite level performers, thereby likely supporting the premise that uncontrollable factors (e.g. nature) may play a role in eventual athletic performance.

Future research that investigates the systemic nature among factors involved in the development of elite athletes is encouraged. Models or theories such as Minuchin *et al.* (1978) systems theory, which espouses that an organism tends to maintain itself within preferred ranges, will provide a framework for future fruitful investigations as they relate to improving the understanding of the development of elite athletic performance. Potential change that is perceived as too great, too sudden, or too far beyond a subjective threshold of tolerance is likely to produce behaviour moving the system back towards its preexisting homeostatic state. Therefore, once a young person constructs his or her strategies for interacting and coping with the self and the environment, he or she will likely behave in a manner congruent with these schemas,

which may move the athlete towards elite performance or impede his or her advancement to the top. The system involved in the development of elite athletic performance appears to be highly idiosyncratic and multidimensional, as illuminated by the 15 swimmers who participated in the current study. However, there appear to be some commonalities (e.g. high levels of focus and motivation). Research that examines these interactions in an ecologically valid domain may be difficult due to currently popular research methods. Reductionistic methods tend to seek the impact of one or a few factor(s) while keeping all other factors constant; a situation that does not occur in world class athletic competitions. Johnson (2007) addressed this in her recent article regarding the complex relationship among a group of ecologically valid factors (e.g. biological, social, developmental experiences and manifest behaviours). Examples of this in the sport psychology literature also exist. Hall *et al.*, (2005) found that some personality traits (e.g. extraversion) have a negative correlation with ratings of perceived exertion (RPE) at low, but not at high, intensities. Additionally, other personality traits (e.g. neuroticism) were unrelated to RPE, and still others (e.g. behavioural inhibition) had a consistent positive relationship, regardless of RPE. Future studies in the area of elite athlete development that incorporate multimethod research approaches will likely advance the understanding of the etiology of elite athletic performance.

Future research may also consider mixed methods designs that attempt to improve the understanding of the role of predispositions, or talent. It may be that 10,000 hours of deliberate practice are not a necessary prerequisite of elite performance (Johnson *et al.*, 2006). Bonanno (2004) addressed this conceptually when he proffered that there are differences in people's resilience and resistance to stress. When confronting stressful events there are multiple, and sometimes unexpected pathways to resilience, and some people continue to have positive emotional experiences and show only minor and transient disruptions in their ability to function relative to others. In the sport domain this may mean that some people have a predisposition to positively manage the stress and challenges associated with training and competing, thereby providing them with a psychological edge over others. This is one of the possible explanations as to why swimmers S3a, S3b and S5c experienced developmental histories that were highly similar to the seven elite swimmers who participated in the current study yet peaked at a sub-elite performance level. There may exist factors outside of human volition that can impact one's eventual achievement level. The current study's data do nothing to disprove this. It may be possible that a specific training regimen that facilitates one athlete's achievement of elite performances may actually impede another's (e.g. swimmers E1 and S1). Additionally, the current study supplies inferential support for the likelihood of some type of biological predisposition as elite athletes can come from very diverse training backgrounds (e.g. E1 and E5b).

Comparing the developmental experiences of elite and sub-elite swimmers, as was done in this study, sheds light on the psychological factors that possibly contribute to achieving elite and sub-elite performances. Although the elite and three of the sub-elite (i.e. S3a, S3b and S5c) swimmers who participated in this study were afforded

similar opportunities (e.g. Self-Efficacy, Structural Resources and Social Resources), different performance levels occurred. Even though S3a is presently competing and improving at a rate that may eventually culminate in elite performances, this still leaves two sub-elites with life experiences analogous to elites who did not achieve elite performances. Currently, it is not clear whether following a specific developmental pattern leads to elite performances or if people who possess the potential for elite performance are able to engage in copious amounts of deliberate practice and have high self-efficacy. Which comes first, the chicken or the egg? However, when taken as a whole, the results found herein support the contention that it is possible for peoples' inherently different physical and/or psychological attributes to impact their potential level of achievement in a particular domain. Everyone is unique (e.g. we have unique anthropometric measurements and personalities). To argue that all healthy humans have the same potential to achieve in sport, as does the theory of deliberate practice, is tantamount to denying this very fact.

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References

- Baker, J. (2003) Early specialization in youth sport: a requirement for adult expertise? *High Ability Studies*, 14, 85–94.
- Baker, J. & Côté, J. (2003) Resources and commitment as critical factors in the development of 'gifted' athletes, *High Ability Studies*, 14, 139–140.
- Baker, J. & Horton, S. (2004) A review of primary and secondary influences on sport expertise, *High Ability Studies*, 15, 211–228.
- Bloom, B. S. (1985) *Developing talent in young people* (New York, Ballentine).
- Bonanno, G. A. (2004) Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events, *American Psychologist*, 59, 20–28.
- Côté, J. (1999) The influence of the family in the development of talent in sport, *The Sport Psychologist*, 13, 395–417.
- Côté, J., Ericsson, K. A. & Law, M. P. (2005) Tracing the development of athletes using retrospective interview methods: a proposed interview and validation procedure for reported information, *Journal of Applied Sport Psychology*, 17, 1–19.
- Durand-Bush, N. & Salmela, J. H. (2002) The development and maintenance of expert athletic performance: perceptions of world and Olympic champions, *Journal of Applied Sport Psychology*, 14, 154–171.
- Ericsson, K. A., Krampe, R. T. & Tesch-Romer, C. (1993) The role of deliberate practice in the acquisition of expert performance, *Psychological Review*, 100, 363–406.
- Ericsson, K. A. & Lehman, A. C. (1996) Expert and exceptional performance: evidence of maximal adaptation to task constraints, *Annual Review of Psychology*, 47, 273–305.
- Gall, J. P., Gall, M. D. & Borg, W. R. (2005) *Applying educational research: a practical guide* (Boston, Pearson).

- Gould, D., Dieffenbach, K. & Moffet, A. (2002) Psychological characteristics and their development in Olympic Champions, *The Journal of Applied Sport Psychology*, 14, 172–204.
- Gould, D., Guinan, D., Greenleaf, C., Medbery, R. & Peterson, K. (1999) Factors affecting Olympic performance: perceptions of athletes and coaches from more and less successful teams, *The Sport Psychologist*, 13, 371–394.
- Hall, E. E., Ekkekakis, P. & Petruzzello, S. J. (2005) Is the relationship of RPE to psychological factors intensity-dependent? *Medicine and Science in Sport and Exercise*, 37, 1365–1373.
- Helsen, W., Hodges, N. J., Van Winckel, J. & Starkes, J. L. (2000) The roles of talent, physical precocity, and practice in the development of soccer expertise, *Journal of Sport Sciences*, 18, 727–736.
- Helsen, W. F., Starkes, J. L. & Hodges, N. J. (1998) Team sports and the theory of deliberate practice, *Journal of Sport & Exercise Psychology*, 20, 12–34.
- Hendry, L. B. & Kloep, M. (2002) *Lifespan development: resources, challenges, and risks* (London, Thomson Learning).
- Johnson, M. B., Tenenbaum, G. & Edmonds, W. A. (2006) Adaptation to physically and emotionally demanding conditions: the role of deliberate practice, *High Ability Studies*, 17, 117–136.
- Johnson, W. (2007) Genetic and environmental influences on behavior: capturing all the interplay, *Psychological Review*, 114, 423–440.
- Mallett, C. J. & Hanrahan, S. J. (2004) Elite athletes: why does the ‘fire’ burn so brightly?, *Psychology of Sport and Exercise*, 5, 183–200.
- Marsh, H. W. & Perry, C. (2005) Self-concept contributes to winning gold medals: causal ordering of self-concept and elite swimming performance, *Journal of Sport & Exercise Psychology*, 27, 71–91.
- Marshall, C. & Rossman, G. R. (1999) *Designing qualitative research* (3rd edn) (Newbury Park, Sage).
- Masters, K. S. & Ogles, B. M. (1998) Associative and dissociative cognitive strategies in exercise and running: 20 years later, what do we know?, *The Sport Psychologist*, 12, 253–270.
- McMillan, J. H. & Schumacher, S. (2006) *Research in education: evidence-based inquiry* (6th edn) (Boston, Allyn and Bacon).
- McNair, D. M., Lorr, M. & Droppleman, L. F. (1971) *Manual for the profile of mood states* (San Diego, CA, Educational and Industrial Testing Service).
- Minuchin, S., Rosman, B. L. & Baker, L. (1978) *Psychosomatic families: anorexia nervosa in context* (Cambridge, MA, Harvard University Press).
- Morgan, W. P. (1978) Sport personality: the credulous-skeptical argument in perspective, in: W. F. Straub (Ed.) *Sport psychology: an analysis of athlete behavior* (Ithaca, NY, Movement), 330–339.
- Morgan, W. P. (1980) The trait psychology controversy, *Research Quarterly for Exercise and Sport*, 51, 50–76.
- Orlick, T. & Partington, J. (1988) Mental links to excellence, *The Sport Psychologist*, 2, 105–130.
- Patton, M. Q. (2002) *Qualitative research and evaluation methods* (3rd edn) (Thousand Oaks, CA, Sage).
- Smith, R. E., Schultz, R. W., Smoll, F. L. & Ptacek, J. T. (1995) Development and validation of a multidimensional measure of sport-specific psychological skills: the Athletic Coping Skills Inventory-28, *Journal of Sport & Exercise Psychology*, 17, 379–398.
- Starkes, J. L., Deakin, J. M., Allard, F., Hodges, N. J. & Hayes, A. (1996) Deliberate practice in sport: what is it anyway?, in: K. A. Ericsson (Ed.) *The road to excellence: the acquisition of expert performance in the arts and science, sports and games* (Mahwah, NJ, Erlbaum), 81–106.
- Starkes, J. L., Helsen, W. & Jack, R. (2001) Expert performance in sport and dance, in: R. N. Singer, H. A. Hausenblas & C. M. Janelle (Eds) *Handbook of research on sport psychology* Vol. 2 (New York, Wiley), 174–201.

- USA Swimming, Inc. (2002) Available online at: http://www.usaswimming.org/USASWeb/_Rainbow/Documents/88ff10da-56df-42e0-8dc3-b2e2bac1fa65/USAS%20General%20Membership%20Info.pdf (accessed 9 May 2007).
- Young, B. W. (1998) *Deliberate practice and skill acquisition in Canadian middle distance running*. Unpublished master's thesis, University of Ottawa, Canada.