Patterns of Early Involvement in Expert and Nonexpert Masters Triathletes

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The benefits of lifelong involvement in physical activity are well known, including decreased risk of cardiovascular disease, hypertension, and diabetes (Katzmarzyk, Janssen, & Ardern, 2003) as well as increased physical and mental health (Mazzeo et al., 1998). Despite these benefits, rates of physical activity typically decline with advancing age. Investigations of physical activity involvement across the lifespan show a trend toward peak involvement during early to mid adolescence followed by decreasing involvement from that point forward (Crocker & Faulkner, 1999; De Knop, Engström, Skirdstad, & Weiss, 1996; King & Coles, 1992).

This pattern has considerable long-term effects. Indeed, much of the decline in physical and cognitive abilities with advancing age is thought to result from disuse rather than age per se (Maharam, Bauman, Kalman, Skolnik, & Perle, 1999). Studies of cognitive and motor skills, such as chess (Charness, 1981) and typing (Salthouse, 1984), as well as physiological capacities, such as maximal strength (Tarpenny, Hamilton-Wessler, Wiswell, & Hawkins, 2004), suggest individuals can maintain performance at high levels in spite of advancing age, with continued involvement in the activity. As a result, the lack of physical activity in older adults has been identified as a primary contributor to decreases in functional capacity and increases in morbidity and mortality (DiPietro, 2001).

Masters athletes deviate from the typical profile of aging and physical activity levels. They report maintaining higher than average physical activity levels throughout the lifespan (Hawkins, Wiswell, & Marcell, 2003). Perhaps as a consequence of this involvement, this group also reports higher levels of physical and mental health (Shepherd, Kavanagh, Mertens, Qureshi, & Clark, 1995).

Masters athletes are a particularly interesting group for investigating issues of aging and ability. Starkes and colleagues (Starkes, Weir, Singh, Hodges, & Kerr, 1999; Starkes, Weir, & Young, 2003) and Deakin, Baker, and Horton (2004) found that high levels of competitive sport involvement could delay the onset of performance decline thought to be inevitable with increasing age. Their data indicate that with regular involvement in physically and cognitively challenging activities the aging process can be much more positive than previously assumed. As a result of their ability to maintain high levels of physical and cognitive skill, Masters athletes have been presented as an ideal model of successful aging (Hawkins et al., 2003).

We have little understanding of the patterns of physical activity participation that promote Masters level involvement. The years prior to adulthood may be of particular importance given that most withdrawal from sport and physical activity occurs during this time (De Knop et al., 1996). The Developmental Model of Sport Participation (DMSP; Côté, Baker, & Abernethy, 2003; Côté & Hay, 2002) suggests three different outcomes of sport participation: (a) elite participation, (b) recreational participation, and (c) drop out. The type of activities and contexts one experiences at different stages of development determine where a sport participant will ultimately end. For instance, focusing on a single form of physical activity (referred to as early specialization) is associated with increased dropout rates (Baker, 2003; Wiersma, 2000), while participating in a broad
range of sports and physical activities is associated with adherence to exercise in both recreational exercisers (e.g., Robertson-Wilson, Baker, Côté, & Derbyshire, 2003) and elite athletes (e.g., Baker, Côté, & Abernethy, 2003). However, this assumption remains to be tested with Masters athletes.

The ultraendurance triathlon presents a unique sport for examining Masters-level involvement. On the one hand, involvement in this sport represents a fairly extreme form of physical activity with applicability to a small cohort of athletes, while on the other its general structure promotes continued participation across the lifespan, unlike sports such as gymnastics and/or figure skating. Acceptance of triathlon as a "lifespan sport" is evident from its inclusion in the World Masters Games, representing the pinnacle of achievement in this level of sport. The purpose of this investigation was to explore the early sport involvement and training in triathlon-related sports as well as other activities in a group of male Masters-level triathletes.

**Method**

Eighteen male Masters-age triathletes were stratified into three groups (expert, middle of the pack, and back of the pack)\(^1\). These athletes were part of a larger study examining expertise development in ultraendurance (UE) sport (Baker, Côté, & Deakin, 2005a, 2005b). Experts (n = 6) were identified as being the highest placing Canadian athletes in Ironman races around North America. Their finishing times (mean finishing time 9 hr 18 min) were required to be two standard deviations above the mean finishing time for their population (i.e., men 25–40 years of age). The Canadian National Triathlon Team head coach verified the list of expert athletes matching these criteria. The mean age for this group was 32.8 years (\(SD = 2.7\)). They had competed in triathlons for an average of 12.5 years (\(SD = 4.8\)). Expert athletes had completed an average of 88.3 (\(SD = 58.9\)) triathlons at the time of data collection.

The middle of the pack group (mid-pack; n = 6) included athletes with finishing times around the mean for all individuals in their age range (mean finishing time 12 hr 16 min). The mean age for these athletes was 39.0 years (\(SD = 2.9\)). They had competed in triathlons for an average of 7.4 years (\(SD = 2.6\)). Mid-pack athletes had completed an average of 37.6 (\(SD = 27.8\)) triathlons at the time of data collection.

The back of the pack group (back-pack; n = 6) included athletes with finishing times in the selection races of greater than two standard deviations from the mean (mean finishing time 14 hr 54 min). The mean age for the back-pack athletes was 35.1 years (\(SD = 3.3\)), and they had competed in triathlons for an average of 5.0 years (\(SD = 2.2\)). Back-pack athletes had completed an average of 25.2 (\(SD = 25.8\)) triathlons at the time of data collection. All athletes provided informed consent to participate in this study.

Each participant completed an adaptation of a structured retrospective interview specifically developed to examine the content and quantity of early sport involvement and practice activities of elite athletes (Côté, Ericsson, & Law, 2005). Interviews were conducted one-on-one in a quiet environment with each interview lasting 2–3 hr. The type and duration of activities in which participants engaged throughout their development was recorded using standardized forms.

The data collection interview was divided into two parts. In Part 1, the athletes were asked to list all involvement in any organized sports or physical activities throughout their development. To facilitate recall, the interviewer asked probing questions designed to improve the athletes' recollection of sport-related activities. For example, athletes were asked to list sporting activities practiced in various contexts, such as participation in team and individual sports. Once they had completed a comprehensive list of sporting activities, the participants reported when they started and stopped participating in each activity. For each year of involvement in a specific sport, athletes were then asked to estimate the average number of months per year and hours per week they engaged in the activity. Based on these two sources of information, the interviewer calculated the estimated hours per year in which the athlete was involved in each activity.

Part 2 of the interview collected information about involvement in various triathlon activities (i.e., swimming, cycling, and running). Following the procedure outlined above, the athletes were asked to list all involvement in swimming, cycling, and running activities throughout their development. Once they had completed a comprehensive list of triathlon activities involvement, the athletes estimated, with probing from the interviewer, the number of months per year and hours per week that they had engaged in each triathlon activity.

**Results**

**Validity of Retrospective Recall Information**

Establishing the validity of data collected using retrospective recall is often problematic. One advantage of using triathletes as a study population is that they typically possess detailed training diaries covering years or even decades of involvement. An analysis of triathletes from the larger study of triathlon expertise who had kept
detailed training diaries during their careers (range 2–7 years) indicated a moderately high correlation ($r = .72$) and a reasonable percentage of agreement (70%) between the number of training hours provided in the interview and corresponding data outlined in the training diaries. Furthermore, evidence recently reviewed by Côté et al. (2005) suggested that athletes are able to reliably estimate the type of sports and the number of hours they have spent in sporting and training activities at different periods in their development.

**Patterns of Physical Activity Involvement**

Due to this study’s focus on the amount and type of physical activity performed from childhood to young adulthood, physical activity involvement was only considered to 30 years of age—the age that qualifies a triathlete for Masters level competition. Figure 1a depicts the profile of involvement (all data given as hours per year) in all forms of physical activity among the three groups of triathletes. All groups demonstrated an increase in physical activity across time, although this was much more pronounced in the expert group. For the mid-pack and back-pack groups, there was a gradual increase over time with a relatively dramatic increase in involvement across the last 4 years. To test for statistical differences among the groups on their involvement pattern in all physical activity forms, a two-way repeated measures analysis of variance (ANOVA) was performed on yearly hours of involvement at 2-year intervals. Results revealed a main effect for group, $F(2, 144) = 12.8, p < .001$, and time, $F(12, 144) = 9.5, p < .001$, indicating that participation rates increased over time and the experts’ involvement was superior to the mid- and back-pack groups, who did not differ. No interaction between time and group was found.

Separate analyses were conducted to examine the relationships between involvement in triathlon-specific sports (i.e., swimming, cycling, and running) and involvement in other sports (Figure 1b and 1c shows involvement in other sports and involvement in triathlon training, respectively). Experts showed an increase in involvement in other sports until late adolescence/early adulthood. Following this, involvement in other sports dramatically declined. Mid-pack triathletes had a similar increase in involvement, but it peaked in mid-adolescence followed by a gradual decrease. For the back-pack athletes, involvement gradually rose until 25 years of age, at which time involvement decreased. All groups showed a relatively minimal involvement in other sports after 27 years of age. Two-way repeated measures ANOVA results revealed a main effect for time, $F(12, 144) = 7.1, p < .001$, but not for group. In addition, there was a significant interaction between group and time, $F(24, 144) = 2.9, p < .001$, which post hoc analyses (Tukey HSD) indicated was attributable to greater involvement by the expert group during adolescence/early adulthood.

Breadth of exposure to other sports was also examined. Experts reported participating in an average of 8.0 ($SD = 2.1$) additional sports (besides swimming, cycling, and running), while mid-pack and back-pack groups were involved in an average of 5.7 ($SD = 3.2$) and 5.8 ($SD = 3.8$) activities, respectively. No statistical differences were found between the groups with respect to the total number of other sports in which they participated prior to 30 years of age ($p = .37$).

For involvement in triathlon-training, all groups had a similar profile of involvement until approximately 20 years of age, with involvement gradually increasing over time. However, at 20 years of age experts rapidly increased their hours of triathlon training, while mid-pack and back-pack athletes’ training was reduced. Triathlon involvement for the expert group continued to increase over time, while the mid-pack group reduced training for a few years and then gradually began to increase their involvement. The back-pack group maintained involvement at a relatively low level. A two-way repeated measures ANOVA was performed on yearly hours of triathlon training at 2-year intervals. Results revealed main effects for group, $F(2, 180) = 10.7, p < .001$, and time, $F(12, 180) = 17.8, p < .001$. There was also a significant interaction between group and time, $F(24, 180) = 4.4, p < .001$. Post hoc analyses (Tukey HSD) indicated this interaction was attributable to the increased training hours by the expert group during later years of involvement.

Table 1 provides the quantity of involvement from age 6 to 30 years in the different forms of physical activity. Not surprisingly, experts have greater involvement in all forms of activity. Perhaps most noteworthy is that they spent over two and a half times more in triathlon-related forms of training. Additionally, only the expert group reported more time spent in triathlon training than other sports and physical activity. One-way ANOVAs were used to examine differences among the groups. Main effects were found for cycle training, $F(2, 15) = 9.98, p < .01$, run training, $F(2, 15) = 5.58, p < .05$, and for total triathlon training, $F(2, 15) = 10.51, p < .01$. Tukey HSD confirmed that experts had accumulated more time in cycle and triathlon training than mid-pack and back-pack athletes and more time in running than back-pack triathletes. No differences were found between the mid-pack and back-pack groups.

**Discussion**

Results from this study contribute to our understanding of Masters athletes in a number of ways. First, they
indicate that the triathletes in the current investigation had considerable involvement in sport and physical activity. Although there was significant variation across the groups, the data confirm this was more than a superficial involvement. The DMSP (Côté et al., 2003; Côté & Hay, 2002) postulates that sampling a range of sports

Figure 1. Hours spent in all forms of physical activity (a), non-triathlon physical activity (b), and triathlon activities (c) by age.
and physical activities is superior to specializing during early development, because it facilitates the development of intrinsic motivation and provides an improved atmosphere for acquiring general motor and physiological capabilities. The current findings provide some support for the DMSP; however, caution is warranted, because there were no control groups. These results also suggest that the relationship between a variable sport involvement during early development and continued involvement with age is independent of skill level, as all three groups reported similar patterns of involvement, albeit at varying quantities.

Second, as expected, Masters athletes have an atypical profile of physical activity throughout development. Previous research has indicated that participation in physical activity typically peaks at around 15 years of age and then rapidly declines; however, there was little evidence of that among these groups. Although the mid- and back-pack groups showed decreases in involvement during their 20s, their involvement in sport and physical activity was still greater than 200 hr per year; moreover, involvement increased after the age of 26 years.

Furthermore, although the overall involvement profile showed an increase in physical activity involvement with age, there was an interaction between time spent in triathlon-related activities and time spent in other sports. During childhood and early adolescence, involvement for all groups was in sports other than swimming, cycling, and running; however, during late adolescence/early adulthood sport and physical activity involvement was primarily in triathlon activities.

Last, expert Masters triathletes were distinguishable from lower skill levels on two factors. They had a greater involvement in triathlon training, particularly in cycle and run training, and they reduced their involvement in other sports and increased their triathlon training at an earlier point than the other groups. Masters athletes have typically been examined as a homogeneous group, but these findings reveal considerable skill-based differences in their training and developmental profiles. While all athletes in the current study competed at the Masters' level, it is likely the back-pack (and possibly mid-pack) athletes competed at a recreational rather than elite level. Researchers should consider different performance levels in examining Masters athletes. Just as elite performers have different psychological and physiological characteristics than nonelite performers at younger ages, it is probable these differences remain with age. While Masters athletes may represent an ideal model of successful aging (Hawkins et al. 2003), the current data suggest that Masters athletes are a complex group.

These data highlight an intriguing issue regarding physical activity involvement among aging populations. Although back-pack triathletes had the lowest involvement level in physical activity, their profile most closely mirrored the amount of physical activity recommended for health promotion (Blair, LaMonte, & Nichaman, 2004). From a performance standpoint there is a robust relationship between time spent in training and ultimate performance, but it is not clear whether the same dose-response relationship exists with health outcomes. Examinations of aging elite athletes have reported increased rates of chronic conditions such as osteoarthritis (Kujala, Orava, Parkkari, Kaprio, & Sarna, 2003; Kujala, Sarna, Kaprio, & Koskenvuo, 1996), suggesting that too much physical activity may have negative long-term consequences.

The current observations on the involvement profiles in Masters triathletes are clearly preliminary; future research needs to build on this work, while correcting for possible limitations of the current methodology. For instance, increasing the sample size may facilitate the identification of further differences between experts and nonexperts not evident in this modest sample. Similarly, the addition of control groups (i.e., adults with "normal" involvement patterns) would add depth to our understanding of the optimal activity involvement profile during childhood, adolescence, and early adulthood.

| Table 1. Means and standard deviations of accumulated hours in triathlon-related training and other activities between 6 and 30 years of age |
|----------------|----------|----------|----------|
|                | Experts  | Mid-pack | Back-pack |
|                | M        | SD       | M        | SD       | M        | SD       |
| Swim training (hr) | 2,761    | 1,323    | 561      | 393      | 1,893    | 3,622    |
| Cycle training (hr) | 4,176    | 2,300    | 1,155    | 818      | 725      | 650      |
| Run training (hr)  | 3,637    | 1,455    | 2,138    | 1,436    | 840      | 1,462    |
| Total triathlon training (hr) | 10,574   | 3,600    | 3,854    | 1,770    | 3,258    | 3,490    |
| Other sports and physical activity (hr) | 9,195    | 3,475    | 6,913    | 3,812    | 4,431    | 4,481    |

Note. M = mean; SD = standard deviation

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Further research is also necessary to clarify the effects of skill/performance level on the aging process of these athletes and the generalizability of these findings to other Masters sports. Continued examination of this population is necessary to provide a comprehensive profile of the aging process.

References


Note

1. Although these athletes were selected for an investigation examining performance in ultraendurance triathlons, they were also involved with short-course
triathlon competition at the Masters level. To qualify for Masters level competition, triathletes must be at least 30 years of age.

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