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Review

Correlates of youth sport attrition: A review and future directions

Shea M. Balish [a,*], Colin McLaren [d], Daniel Rainham [b], Chris Blanchard [c]

[a] Interdisciplinary PhD Program, Dalhousie University, Canada
[b] Department of Environmental Science, Dalhousie University, Canada
[c] Department of Medicine, Dalhousie University, Canada
[d] College of Kinesiology, University of Saskatchewan, Canada

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ABSTRACT

Objectives: This review aims to (a) identify correlates of youth sport attrition, (b) frame correlates within a multilevel model of youth sport participation (i.e., biological, intra-personal, inter-personal, institutional, community, and policy levels), and (c) assess the level of evidence for each correlate.
Design: Review paper.
Methods: Systematic review method.
Results: Entering relevant search terms into PubMed, PsycINFO, SPORTDiscus and Web of Knowledge databases identified 23 articles with a total of 8345 participants. Satisfactory articles largely examined sport-specific attrition and sampled youth from western countries (e.g., Canada, France, Spain, United States). Of the 141 correlates examined, most were framed at the intrapersonal (90) and inter-personal levels (43). The level of evidence for each correlate (i.e., high, low, insufficient) was systematically assessed based on the quantity and quality of supporting articles. In total, 11 correlates were categorized as having a high quality level of evidence and 10 as having a low quality. High quality correlates included, among others, age, autonomy, perceived competence, relatedness, and task climate.
Conclusions: Overall, established correlates of youth sport attrition are largely social in nature. Future directions surrounding (a) the need to examine correlates at lower (i.e., biological level) and higher (i.e., institutional, community, policy) analytic levels, (b) to sample participants from more culturally diverse societies and (c) to examine sport-general attrition are offered.

Converging evidence suggests that sport is a powerful context for promoting the health and well-being of youth (see Holt, 2008). Although sport is associated with some negative outcomes such as underage drinking (Denham, 2011), injuries (Khan et al., 2012) and negative affect (Slater & Tiggemann, 2011), positive outcomes are considered to be more substantial (for discussions see Fraser Thomas, Côté, & Deakin, 2005; Holt, 2008). Youth who participate in sport maintain healthy lifestyle habits including continued physical activity and healthy nutrition (Pate, Trost, Levin, & Dowda, 2000). Those who participate also experience positive emotion (Snyder et al., 2010), sense of belonging (Allen, 2006), life-satisfaction (Vilhjalmsson & Thorlindsson, 1992), and supportive peer relationships (see Smith, 2007). In addition, sport participation is associated with increased academic achievement (Marsh & Kleitman, 2003) and decreased depression and suicidal ideation (Oler et al., 1994; Sabo, Miller, Melnick, Farrell, & Barnes, 2005). Given the potential benefits of youth sport, sporting professionals as well as applied social scientists have highlighted the need to use established empirical research to engage in an ongoing redesign of the sport-relevant environment. Moreover, as the majority of youth sport occurs in an organized fashion wherein rules, procedures, and practices are intentionally designed and largely implemented in a top-down manner, this ongoing redesign is often considered viable (e.g., Fraser Thomas et al., 2005; Gould, 2007).

One intended outcome of this continual redesign is lowered rates of youth sport attrition (Gould, 2007). Recent cross-sectional survey data (Boiché & Sarrazin, 2009) and longitudinal data from sport clubs (Delorme, Chalabaev, & Raspaud, 2011) suggest 30% of

* Corresponding author. Health Geomatics Laboratory, Life Science Center, Biology Wing, Room 833, 1355 Oxford Street, B3H 4R2 Halifax, Nova Scotia, Canada. Tel.: +1 902 266 3674; fax: +1 902 494 1123.
E-mail address: Shea.Balish@Dal.ca (S.M. Balish).

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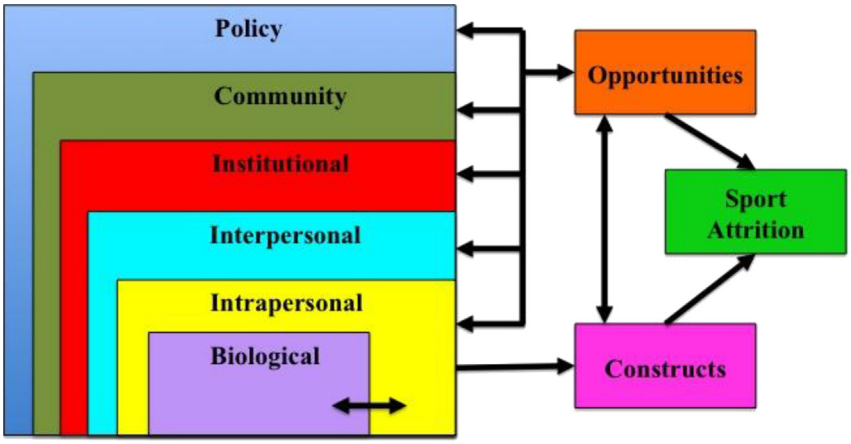

Fig. 1. The social ecological model of sport attrition. Adapted from Emmons (2000).

youth discontinue participation in at least one sport club annually. In Canada, an attrition rate of 30% equates to approximately 600,000[1] instances per year in which youth between the ages of 5 and 14 discontinue participation in a sport club.

One difficulty of building a sound theory of youth sport attrition that can guide this ongoing redesign is the practical constraints of employing experimental designs in youth sport contexts. Accordingly, researchers have placed emphasis on identifying and assessing correlates of youth sport attrition (Gould, 2007). Although youth sport attrition literature traditionally examines individuals and dyads, behavioral correlates can exist at multiple levels of the human environment (Emmons, 2000; Green, Richard, & Potvin, 1996; Spence & Lee, 2003). As recent research suggests correlates of youth sport attrition do, in fact, exist at different analytic levels (e.g., Fraser-Thomas, Côté, & MacDonald, 2010) there is also a need to frame correlates of attrition within a social ecological model of sport attrition (see Fig. 1).

Although several studies have examined youth sport attrition (e.g., Cervelló, Escartí, & Guzmán, 2007; Figueiredo, Gonçalves, Silva, & Malina, 2009; Robinson & Carron, 1982), there has yet to be a systematic review of relevant correlates. This study uses a systematic review method to (a) identify correlates of youth sport attrition, (b) frame correlates within a social ecological model of youth sport attrition, and (c) assess the strength of evidence for each correlate. The following section outlines the methods that guided this review. The full details of the results are presented the online supplementary material in the form of five tables of correlates, with each table corresponding to one level of the proposed social ecological model of sport attrition. The review closes with a critical discussion of the results and recommendations for future research.

Methods

Selection of the literature

A search of the relevant literature was conducted using a sequential four-step process among the PubMed, PsycINFO, SPORTDiscus, and Web of Knowledge databases (see Fig. 2). First, to identify relevant articles, the term 'sport participation' was entered into each database search engine in combination with keywords associated with sport attrition (i.e., adherence, attrition, burnout, cessation, continued, continuation, dropout, drop-out, discontinued, discontinuation, prolonged, quit, sustained, termination, withdraw, withdrawal) and keywords associated with different social ecological levels (i.e., club, community, correlates, determinants, environment, policy). After removing duplicates, this process resulted in a total of 2133 articles.

In the second step the title and abstract of the identified articles were examined for relevance to the aims of the review, resulting in a total of 118 remaining articles. In Step 3 the body of each article was assessed for the inclusion criteria. To satisfy inclusion criteria, each study was required to be (a) published in a peer-reviewed journal during or after the year 1980, (b) written in the English language, (c) the majority (>50%) of participants are under the age of 20 years, (d) document either a subjective or objective dichotomous measure of sport attrition (i.e., 0,1; participators and discontinuers), and (e) report a statistical test and the descriptive data of at least one correlate of sport attrition. This third step resulted in 17 satisfactory articles. In the last step the reference lists of satisfactory articles were reviewed for additional articles that would meet the inclusion criteria. An additional 6 articles were added to the list of satisfactory articles, resulting in a total of 23 articles for inclusion in the review.

Defining youth, sport, and youth sport attrition

Following Deaner et al. (2012), we define sport as *a game requiring physical skill where two or more sides compete according to agreed upon rules.* According to this definition, any games or physical activities that commonly do not include organized competition (e.g., yoga, aerobics, surfing) are not considered sport and thus do not meet the inclusion criteria. We define youth as *the transition from early childhood until early adulthood where the young adult is no longer reliant on their parents for essential means. We quantified this transition as between the ages of 7 and 20* as evidence suggests an individual's home/parental environment explains the majority of physical activity and sport participation (Stubbe, Boomsma, & De Geus, 2005). However, once individuals seem to leave the home/parental environment (between ages of 17–20), the explanatory value of this environment significantly diminishes. It should be noted that this definition of youth is more broad than previous definitions that often describe youth as the period of transition between early

[1] This number was calculated by multiplying attrition rate of 30% and Clark's (2008) estimate that 2,000,000 million youth in Canada participate in sport between the ages of 5 and 14.

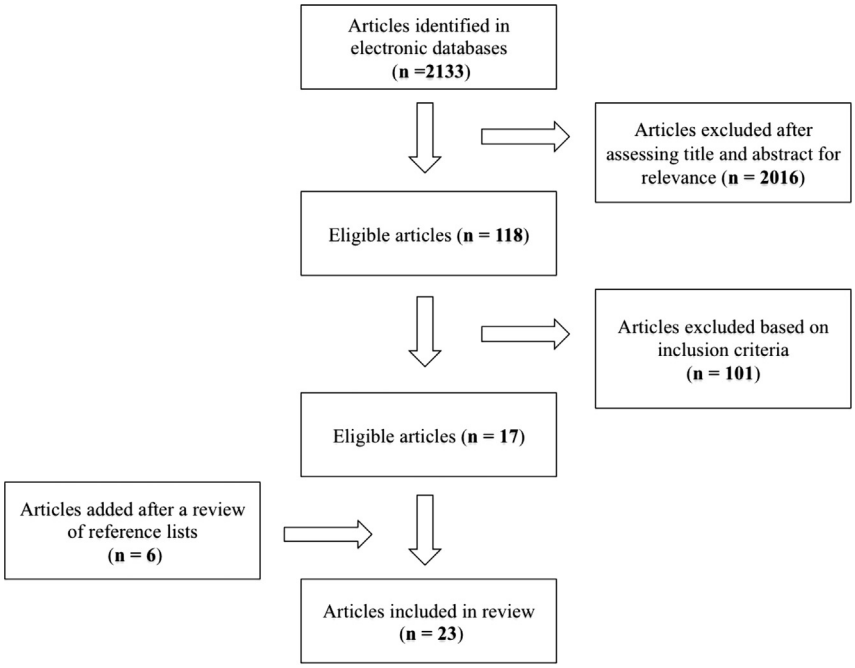

Fig. 2. Flowchart of selection process.

adolescence and early adulthood (13–17; Fraser-Thomas & Côté, 2006). Finally, we follow Gould and Petlichkoff (1988) in defining sport attrition as *the prolonged absence of systematic practice and competition, either in one sport* (sport-specific attrition) *or all sports* (sport-general attrition).

Researchers have traditionally placed emphasis on studying sport-general attrition simply because it is the most practically relevant dichotomy (Gould & Petlichkoff, 1988). However, sport psychologists are not necessarily interested solely in which sport youth participate, but whether they participate at all. Studying sport-specific attrition at young ages may not be meaningful as it may fail to capture the nature of sport participation, which at this age is characterized as sampling—sporadic participation in multiple recreational sports (Côté, Baker, & Abernethy, 2007). However, in what has been described by Côté et al. (2007) as the specializing years, a sub-set of athletes (largely adolescents) begin to specialize in a limited number of sports—often one—in which participation is characterized by more frequent and intense training and competition.

Categorization of correlates

Each sport attrition correlate is categorized at a specific level within the proposed social ecological model (see Fig. 1). Specifically, correlates of (subjective or objective) physical measurement (e.g., weight, height, testosterone level) are categorized at the biological level. Correlates that represented a demographic (e.g., ethnicity, age) or psychological trait (e.g., self-efficacy, ego-orientation) are categorized at the intra-personal level. Correlates that represent a subjective or objective measure of relations among social agents (e.g., mother relationship, peer acceptance) are categorized at the inter-personal level. Although it could be argued that such perceptions should be categorized at the intra-personal level, as they may reflect individuals' biases rather than actual social interactions, for simplicity, we chose the inter-personal level and noted that such correlates are measured via self-report. Correlates that represent a characteristic of a sporting institution (e.g. co-ed, school-based, club-based, cost of club membership) are categorized at the institutional level, whereas correlates that represent a characteristic of a community (e.g. residential mobility, number of recreational areas, distance to recreational areas) are categorized at the community level. Finally, correlates that represent policy related factors (e.g. economic incentives, gender equity policy, health and safety requirements) are categorized at the policy level. To increase accuracy of categorizing correlates, two of the authors (first and second authors) independently coded each correlate. Discrepancies among the authors' choices were critically discussed and resolved to arrive at a final list of categorized correlates (See Supplementary material).

Quality assessment

Due to non-reporting of effect sizes and the overall heterogeneity of methods, pooling data was not possible. Accordingly, we follow Koeneman, Verheijden, Cinapaw, and Hop-man-Rock (2011) in using a best evidence synthesis that accounts for both the consistency and quality of the evidence. First, the methodological quality of each correlate in each study was assessed using a checklist (see Table 1) adapted from checklists used in published reviews of physical activity literature (i.e., Koeneman et al., 2011; Uijtdewilligen et al., 2011). The adapted checklist consists of 11 items (one being specific to prospective studies and another to retrospective studies, resulting in 10 applicable items for any one article). Each satisfied item was scored as either zero or one. A quality score for each correlate for each study was then generated by dividing the total score by the total number of items (10).

The quality index of each correlate is categorized into two different levels. Following Koeneman et al. (2011), we categorize quality indices below 7 as low quality and 7 or above as high quality. Next, the number of independent relationships that reported low or high quality for the correlate was counted. Level of evidence was labeled *high-quality* if there are two or more mutually consistent (either non-significant relationships found or significant

Table 1
Methodological quality assessment checklist adapted from Koeneman et al., (2011) and Uijtdewiligen et al., (2011).

Aspect of study	Description of scoring procedure	
Study population at baseline	1. Participation rate at baseline at least 80 %, or four of the following demographics of the sample were described: gender, ethnicity, race, social class, age, dual/single parent family.	
Retrospective recall and follow-up measurements	Prospective 2. Absence of selective non-response (dropout of study) on key characteristics (e.g., age, gender, correlates, outcome measure) during follow-up measurements. A score was given if follow-up measures were collected via existing databases.	Retrospective 2. Attrition for majority of discontinuers (>50%) occurred at maximum three years prior to collection of non-demographic data. A score was given if only demographic data was collected.
Data Collection	3. Measured sport-general attrition, or if sport-specific attrition was measured, it could be confidently inferred that all participants competed at a relatively high level. 4. Measurement of sport participation and attrition is inferred through a formal database or measured through two or more sources, such as self-report and parental reports. 5. Correlates of sport participation are measured with a reliable tool. A score was given if measures of the correlate showed (a) ≥.70 measure of internal consistency, or (b) Pearson correlation >.70 assessed within the target population, or (c) if satisfactory reliability tests of the tool has been published within a peer-review journal during or after 1980. For biological variables, a score was given only if standardized protocol was followed. A score was also given for self-reported age, gender, ethnicity, martial status, socio-economic status, employment status, education, income, intervention condition and objective assessment of environmental characteristics. 6. Correlates of sport participation are measured with a valid tool. A score was given if one of the following criteria was met: the correlate showed (a) ≥.70 measure of internal consistency, (b) a correlation of ≥.40 with one or more similar constructs measured within the appropriate target population, or (c) if satisfactory validity tests of the tool used to measure the correlate has been published within a peer-review journal during or after 1980. For biological variables, a score was given only if standardized protocol was followed. A score was also given for self-reported age, gender, ethnicity, martial status, socio-economic status, employment status, education, income, intervention condition and objective assessment of environmental characteristics.	
Data analyses	7. Competitive level was homogeneous within the sample, and if not, differences among competitive levels were examined, and if present, were controlled within statistical tests. 8. Gender was homogeneous within the sample, and if not, differences among genders were examined, and if present, were controlled within statistical tests. 9. Results are presented as point estimates and measures of variability (SD, CI, standard error). 10. Number of participants is at least 10 times the number of independent variables.	

relationships in the same direction) relationships of high quality. Correlates are labeled *low-quality* if there are mutually consistent findings in one high quality and one low quality relationship, or two or more low quality relationships. Correlates are labeled *insufficient* if only one study examined that correlate, if inconsistent (opposite direction of relationship or significant/non-significant) findings from 'high quality' relationships represent more than 20%, or if high and low quality relationships represent more than 33.4%, of the relevant relationships. To facilitate generating quality index for each correlate, the first and second authors (first and second authors) independently assessed the quality of each correlate within each study. Discrepancies among the authors' choices were critically discussed and resolved to arrive at a final index for each correlate (See Supplementary material).

Data extraction and synthesis

Several questions guided data extraction and synthesis from satisfactory articles:

- What correlates were examined?
- At what level of the social ecological model is the correlate situated?

- How many male and female participants did the study include? What is the overall age range or, if not reported, mean age?
- What country were the participants sampled from?
- What sport(s) were examined?
- What is the descriptive data (e.g., proportion, mean and standard deviation) for participators and discontinuers regarding each correlate?
- What is the statistical association between attrition and this correlate?
- Did the association reach statistical significance at the $p < .05$ level?
- Using the quality checklist, what was the quality of evidence for each correlate in each study?
- What is the level of evidence for each correlate?

We ignored latent, composite, and sport-specific variables (e.g., dribbling speed in soccer), primarily due to their rarity, problems with generalizability, and to reduce the complexity of interpretation of the results. Several studies (i.e., Burton, 1992; Ullrich-French and Smith, 2009) reported two independent statistical tests (e.g., two different regression models) of one correlate (e.g., perceived competence). In such cases we extracted relevant information from the model that included the (a) most predictors and (b) did not include interaction terms.

Results

One hundred forty one distinct correlates are examined within the 23 satisfactory articles published between 1982 and 2012. The pooled number of participants is 8345 (when excluding one outlying sample of 74645) with a mean 379.3 and a range of 12–2180. Approximately 4354 (52.17%) are described as male and 3177 (38.07%) as female, while 814 are not reported (9.75%). Ages of participants ranged from 7 to 20. Sixteen studies sampled athletes from only one type of sport while the other seven sampled from multiple sports (See Online Supplementary material). However, all studies (23) but one (i.e., Jakobsson, Lundvall, Redelius, & Engström, 2012) examined sport-specific attrition. Regarding the methodological design, eight studies are cross-sectional, two were case control, one was quasi-experimental, and 12 were prospective. The length of time for prospective designs range from 8 to 48 months, with an average of 20.6 months. Specific sports included handball (3), soccer (3), swimming (3), followed by wrestling (2), baseball (1), basketball (1), gymnastics (1), hockey (1), and jujitsu (1). Together, articles sampled participants from 8 countries: France (7), United States (5), Canada (4), Estonia (2), Spain (2), Australia (1), Germany (1), and Sweden (1). The guiding theoretical models and frameworks within the satisfactory articles consisted of Self-Determination Theory (6), Achievement Goal Theory (6), the Developmental Model of Sport Participation (3), Theory of Planned Behavior (1), Bourdieu's Habitus, Capital, and Field framework (1), Expectancy Value Theory (1), Social Exchange theory (1). Five satisfactory articles do not explicitly identify a guiding theoretical framework. Overall, this review identified 21 correlates (11 high quality, 10 low quality), all of which concern sport-specific attrition.

Table 2
Correlates of youth sport attrition with high and low quality evidence.

Level	Correlate	Evidence
Biological	Age	High (+)
Intrapersonal	Amotivation	High (+)
	Autonomy	High (−)
	Identified regulation	High (+)
	Intention to dropout	High (+)
	Intrinsic motivation for accomplishment	High (−)
	Intrinsic motivation for stimulation	High (−)
	Perceived Competence	High (−)
	Relatedness	High (−)
	Attributing success to external sources	Low (−)
	Conflict between sport and non-sport activities	Low (+)
	Intention to participate in sport	Low (−)
	Intrinsic motivation	Low (−)
	Positive expectancies of future in sport	Low (−)
	Value of Sport	Low (−)
Interpersonal	Ego climate	High (NA)
	Task Climate	High (−)
	Coach relationship	Low (−)
	Peer induced ego motivational climate	Low (NA)
	Peer induced task motivational climate	Low (−)
	Presence of close friendships in sport	Low (−)

Note: '+' = positive relationship with attrition, '−' = negative relationship with attrition, NA = no association.

Biological correlates

Three variables are situated at the biological level: age (high-quality evidence), body mass index (insufficient), and height (insufficient evidence). Three high quality sides reported a statistically significant negative relationship with youth sport attribution (See Online Supplementary material).

Intrapersonal correlates

The majority of correlates (90/141) are categorized at the intrapersonal level (See Online Supplementary material), 8 of which display high-quality evidence and 6 display low-quality evidence (see Table 2). Perceived competence emerged as a high-quality correlate and is the most examined correlate the reviewed articles. Although two low quality articles report non-significant associations, it should be noted that their measurement of perceived competence is less extensive than those reporting a significant relationship. Other high-quality correlates included amotivation, autonomy, identified regulation, intention to dropout, intrinsic motivation for accomplishment, intrinsic motivation to experience stimulation, and relatedness. Low-quality correlates include attributing success to external sources, conflict between sport and non-sport activities, intention to participate in sport, intrinsic motivation, positive expectancies of future in sport, and value of activity.

Interpersonal correlates

Forty-three variables emerged at the interpersonal level emerged, two of which are scored as high-quality and four as low-quality (see Table 2). High-quality correlates included ego climate (no association) and task climate (negative association) while low-quality correlates included positive coach relationship (negative association) peer-induced ego motivational climate (no association), peer-induced task motivational climate (negative association), and presence of close friendships in sport (negative association).

Institutional correlates

Three variables with insufficient evidence emerged at the institutional level: annual cost of sport, type of school (i.e., high academic ability, vocational schools), and type of sport (i.e., team, individual). Although two studies reported low-quality odds-ratios (range = 0.39–0.59) for athletes from high-academic ability schools, one low quality relationship did not reach statistical significance, thus classifying this correlate as having insufficient evidence (See Online Supplementary material).

Community correlates

Two correlates with insufficient evidence emerged at the community level: community size and distance to activity. The lone article examining community size is high quality, statistically significant, and reports a relatively large odds-ratio (OR = 4.74).

Policy correlates

No policy correlates are reported in the satisfactory articles.

Discussion

Fundamentally, sport participation requires two types of resources: (a) opportunities to engage in sport, and (b) the motivation to engage these opportunities. Although these two resources are intertwined (opportunities influence motivation and vice versa), the study of sport attrition has traditionally placed more emphasis on understanding factors involved in youth's self-selection out of sport rather than the decline of opportunities (e.g., injuries, lack of sport clubs). On this view, it is not so surprising that 18 correlates identified as having either high-quality or low-quality evidence were psychological constructs and all were categorized at the intrapersonal and interpersonal levels.

At the intrapersonal and interpersonal levels, the multiplicity of the examined correlates suggests that there is a need for more in-depth examination and refinement of important correlates and corresponding theory. In contrast, the biological, institutional, community and policy levels are relatively unexplored. However, a lack of research does not necessarily justify its need. Indeed, conducting a-theoretical exploratory research is, by definition, highly inefficient. Ideally, researchers should derive predictions from established and emerging theories at the interpersonal and intrapersonal levels to guide branches of efficient research into less-examined neighboring analytic levels. This branching will progress understanding of youth sport attrition, and will simultaneously progress prevailing theories via falsification or qualification. Integrating theories across higher and lower analytic levels has been termed by Barkow (2006) and Slingerland (2008) as 'vertical integration' and is anticipated to characterize future progress in the social sciences. The following discussion is framed within the proposed social ecological model of sport attrition (Fig. 1). The architecture of the social ecological model of sport attrition follows in the ecological tradition only in so far as it operationalizes multiple analytic levels as a series of increasingly larger physical contexts: biological, intrapersonal, interpersonal, institutional, community, and policy (see Fig. 1).

Biological level

Prominent social ecological models (e.g., Emmons, 2000) and models of youth sport attrition (e.g., Gould, 2007) do not include, nor meaningfully discuss, biological correlates. Indeed, as this review demonstrated, age, body mass index, and height are the only three examined biological correlates of youth sport attrition within the satisfactory articles. The proposed social ecological model of sport participation (see Fig. 1) explicitly separates biological correlates from those commonly included at the intrapersonal level (e.g., personality traits, age, ethnicity) for two reasons. First, biological correlates and psychological/demographic correlates are different analytic units representing different natural systems that exist at different levels of the environment and, accordingly, necessitate different tools and methodologies. Second, recent research has demonstrated biological influences on sport behavior that are relevant to youth sport attrition. For example, one potentially fruitful area of future research at the biological level may be the influence of testosterone. Testosterone is a hormone associated with the development of athletic prowess and competitiveness (Archer, 2006; Mazur & Booth, 1998). A number of studies have found links between pre-natal testosterone and sporting behavior (Giffin, Kennedy, Jones, & Barber, 2012; Manning & Taylor, 2001; Paul, Kato, Hunkin, Vivekanandan, & Spector, 2006; Tlauka, Williams, & Williamson, 2008). In fact, females with congenital adrenal hyperplasia—an uncommon condition that often involves increased levels of pre-natal testosterone—tend report more interest in sport than females without the condition (Berenbaum, 1999; Frisen et al., 2009).

The relative lack of biological correlates in this review simply stems from a lack of research. Perhaps the most efficient strategy to reverse this trend will be to develop theories at the intrapersonal and interpersonal levels that can predict how biological correlates actually influence sport participation. Indeed, consider the previous example of testosterone. There are two mediating pathways which may explain why pre-natal testosterone could be associated with sport attrition. The first is effects on physiology. High levels of pre-natal testosterone are associated with the development of more efficient cardiovascular systems, more physical endurance, more speed, and superior visuospatial abilities (Manning & Taylor, 2001). These physical attributes may mediate the relationship between testosterone and perceived competence, thus leading to motivation for continued participation. The second pathway may be direct affects on psychology. A recent review suggests that testosterone may be best understood as a "social hormone" that regulates the search for, and maintenance of, social status (Eisenegger, Haushofer, & Fehr, 2011). Given that sport is one of the most status relevant youth activities (Chase & Dummer, 1992; Chase & Machida, 2011), there is merit in exploring the role of testosterone in our understanding of youth sport attrition.

Intra-personal level

The intrapersonal level included eight of the eleven high-quality correlates and six of the ten low-quality correlates, making it the most prominent analytic level within the identified articles. Although a number of these correlates are interrelated and follow from an established theory (SDT), when considered independently some correlates are more descriptive than explanatory. Such correlates include *intention to dropout* (high-quality), *intention to participate* (low-quality), and *amotivation* (high-quality). While these correlates are closely tied to youth sport attrition, and they do align with phenomenological accounts (Allender, Cowburn, & Foster, 2006), there is a need to move beyond this level of explanation and to converge on the underlying mechanisms that explain why intentions and motivation vary across youth. For example, why, among all other possible states, are individuals not motivated? Such an appeal for a more theoretical approach to the study of youth sport attrition is not new. Over the past several decades, researchers have recurrently highlighted the need for a more theoretically oriented and integrated approach to the study of youth sport attrition (e.g., Gould, 2007; Gould & Petlichkoff, 1988; Klint & Weiss, 1987).

Self-determination theory

Most correlates at the intrapersonal level align in some way with self-determination theory (SDT; Ryan & Deci, 2000). At a general level, SDT argues that intrinsic motivation (i.e., engaging in a task for its inherent value) represents a stable and enjoyable form of motivation that can foster "constructive social development and personal well-being" (p. 68). A number of identified correlates measured general aspects intrinsic motivation, including *intrinsic motivation* (low-quality), *intrinsic motivation to experience stimulation* (high-quality), *intrinsic motivation to experience accomplishment* (high-

quality), *perceived value of activity* (low-quality), all of which were negatively associated with sport attrition.

SDT is an increasingly established theory that, although multi-faceted, argues that humans possess three fundamental needs that are the source of intrinsic motivation: (a) the need for autonomy or self-governance, (b) the need for competence or mastery, (c) and the need for relatedness or affiliation (Ryan & Deci, 2000). These needs are described as free-floating goal states that individuals consciously strive to satisfy and are "the basis for self-motivation and personality integration, as well as for the conditions that foster those positive processes" (Ryan & Deci, 2000; p. 68). The results of this review align with SDT's claim for the existence of three fundamental needs; the correlates *autonomy* (high-quality), *perceived competence* (high-quality), and *relatedness* (high-quality) are established high quality correlates of youth sport attrition. However, it should be noted that there are also some of the most studied (6 of the 23 satisfactory studies explicitly tested SDT). Future research may find similar support for other theories or frameworks.

Popularized by Harter (1982), perceived competence is commonly described as the perception of one's capacity (either self or norm-referenced) to successfully complete a specific-task or set of tasks, in this case, the tasks involving a specific sport. Given the extensive evidence demonstrating the central role of *perceived competence* in sport and physical activity adherence (Mack, Sabiston, McDonough, Wilson, & Paskevich, 2011), it is not surprising that it is the most commonly studied correlate across the identified articles. Perceived *autonomy*, that is, the perception of an internal locus of causality (that one's behavior is self-governed) is another fundamental need postulated by SDT (Ryan & Deci, 2000). While SDT considers autonomy to be a distinct goal-state that individuals strive to satisfy, it seems to be functionally tied to perceived competence in so far as perceived competence does not increase intrinsic motivation unless it is complemented by a sense of autonomy (deCharms, 1968). Categorized at the inter-personal level, *relatedness* is commonly described as a domain-general motivation to satisfy the need for social attachment (Ryan & Deci, 2000). It is domain-general in the sense that many forms of social relations, such as a relationship with a parent, coach, or team, are argued to be motivated by the same need for relatedness. Other correlates emerging from this review that align with 'relatedness' include *presence of friendships in sport* (low-quality) and *positive coach relationships* (low-quality), both of which were negatively associated with sport attrition. From an SDT perspective, positive friend and coach relations satisfy the need for relatedness, leading to motivation for participation (Pelletier, Fortier, Vallerand, & Briere, 2001).

This review also reveals that prominent theories of physical activity (PA) behavior have yet to be applied to the study of youth sport attrition. For example, Plotnikoff, Costigan, Karunamuni, and Lubans (2013) reviewed literature that employed social cognitive theory (SCT) to explain adolescent physical activity and found that SCT explained 33% of the variance for PA behavior and 48% for PA intentions. Applying established theories such as SCT to the study of youth sport attrition may reveal more important correlates of youth sport attrition. Further, a more diverse theoretical approach may facilitate a synthesis of a multi-theoretical model of youth sport attrition, as has been suggested for other populations (Blanchard, 2012).

Inter-personal level

The interpersonal level, which contains two high-quality correlates (ego climate and task climate) and four low-quality correlates (coach relationship, peer induced ego motivational climate, peer induced task motivational climate, presence of close friendships in sport), is the second most prominent level examined within the identified articles.

Ego and task climate (high-quality) and peer induced ego climate and peer induced task climate (low-quality) emerged as four of the six high-quality or low-quality correlates in this review. However, ego and task had differential relationships with sport attrition. An ego climate is one where norms support peer-referenced perceptions of success and a primary focus on winning. A task climate supports self-referenced perceptions of success and a primary focus on improvement (Keegan, Harwood, Spray, Lavallee, 2010). Overall, the review suggests ego climates are not associated with youth sport attrition while task climates are significantly negatively associated.

Given the social differences between ego and task climates, it seems perceived competence may be a mediating factor between motivational climates and attrition (for an overview see Keegan, Harwood, Spray, Lavallee, 2010). As perceptions of competence are peer-referenced within ego climates they are thus entangled within a zero-sum game (Vallerand, Gauvin, & Halliwell, 1986). Increases in perceived competence for some will lead to decreases for others, thus balancing overall changes in perceived competence. Since a task climate supports self-referenced perceptions of competence, increases in perceived competence are not tied to others (at least by definition) and thus can foster greater levels of perceived competence, and perhaps in turn, decreased attrition. However, the association between an ego climate and attrition may depend on athletes' competitive level. Several studies that examined ego climate on attrition recruited older youth who competed at a relatively high competitive level (Jõesaar, Hein, & Hagger, 2011; Le Bars & Ninot, 2009). The context of more competitive late-adolescent sport may select athletes whose motivation is not negatively affected by an ego climate. Or perhaps the increased prestige or status of participating on a competitive team masks any effect of an ego climate on attrition. Future research should examine how an ego climate is associated with sport continuation and attrition at different ages and different competitive levels.

Presence of friends in sport and quality of coach relationship also emerged as low-quality correlates. These findings suggest that, instead of a domain-general need for relatedness—as SDT maintains—motivation for sport that arises through social relationships may systematically vary for different types of agents such as friends and coaches, as this review demonstrates. Indeed, evidence suggests different social relations possess independent predictive value of sport attrition (Ullrich-French & Smith, 2009) and have differential outcomes, such as on self-esteem (Leary, 2004). Moreover, theory emanating from evolutionary biology suggests that different agents posed different adaptive problems over human evolution, and thus should have selected for psychological mechanisms that differentiate kin, peers, and leaders and regulate motivation accordingly (Gaulin & McBurney, 2004). Future research will be necessary to unearth if there are distinct psychological mechanisms motivating relations with specific agents, such as with coaches, friends, and groups, and how those motivations impact the decision to continue or discontinue sport participation.

A major limitation of studies that examined interpersonal correlates is the overreliance on self-report. Although self-report is a vital type of measurement in the study of sport attrition, it is subject to several major biases. First, behavior is often guided by intuition rather than reason and thus people often do not know why they behave in certain ways (Haidt, 2001). Accordingly they construct post-hoc rationalizations (for an example see Haidt, Bjorklund, & Murphy, 2012) and can convince themselves they are true (for a review see Von Hippel & Trivers, 2011). A second major bias is that participants are not always honest. For example, an athlete who enjoys competing in sport because of his or her capacity to dominate others or to gain

popularity may inaccurately report these reasons because he or she recognizes the social stigma surrounding these social goals (e.g., social desirability response bias; Nederhof, 1985). Given that ten of the 23 articles were retrospective in nature, self-report biases may have a significant effect on the results of this review.

Less subjective types of measurement may assist in alleviating self-report bias. For example, Smith's (2007) appeal for observational methods may bear fruit. Vierimaa (2012) found that athletes rated popular (high status) by their peers were also rated by coaches and peers as being most athletically competent. Popular athletes were more sociable overall, interacted more with peers, and received more technical and prosocial feedback than less popular (low status) athletes. It would be revealing to examine if observed social interactions are associated with attrition.

Institutional, community, and policy levels

Although all community, institutional, and policy level correlates possessed insufficient evidence, there were a number of interesting findings that warrant future research. At the institutional level, Wattie et al. (2012) demonstrated that relative to vocational schools, youth in high academic ability schools are .39–.41 times as likely to discontinue sport participation. Jakobsson et al. (2012) found similar yet statistically insignificant associations. At the community level, Fraser-Thomas et al. (2010) demonstrated that the odds of discontinuing in sport are 4.74 times greater for athletes from larger communities.

Correlates at the community, institutional, and policy levels often represent structural factors (e.g., opportunities) that can influence sport participation and attrition on a large scale. For example, aligning with Fraser-Thomas's research, Turnnidge, Hancock, and Côté (2014) found that youth living in smaller communities (population $<$ 100,000) are more likely to participate in Canadian minor hockey than those from larger cities. While compositional (e.g., different personal resources) and collective effects (e.g., cultural norms) cannot be ruled out (and likely contribute in some manner) this effect could easily stem from differences in opportunities (contextual effects). For example, opportunities (per-capita) to participate in competitive sport may diminish with age at a greater rate in larger cities than in smaller cities. For example, in a large city, for every ten 'spots' to play competitive hockey at age 10 there may be three 'spots' at age 15. Yet in a smaller community, for every ten spots at age 10 there may be five spots at age 15. Moreover, this discrepancy of opportunities may be further enlarged due to youth from smaller communities traveling to larger communities to participate on more competitive teams. This "differential diminishing opportunities" hypothesis is an avenue for future research.

Initial research at higher levels of the social ecological model seems promising for understanding youth sport attrition. However, researchers should demonstrate caution when interpreting these findings, especially when inferring differences among contexts from individual level data. For example, the differing composition of the athletes in institutions can bias interpretations of institutional effects. Indeed, high academic ability schools do not contain the same athletes as vocational schools. To tease out the influence of institutions future research will need to collect actual institutional level data as well as control for a variety of potentially confounding variables at the individual level.

While environmental variables (e.g., proximity to recreational areas, community socioeconomic status, transportation) have received an increasing amount of attention within physical activity literature (Davison & Lawson, 2006; Gordon-Larsen, Nelson, Page, & Popkin, 2006) they have garnered much less attention within sport attrition literature. The lone environmental correlate that emerged in this review is *distance to activity* (insufficient). Contrary to Boiché and Sarrazin (2009) prediction, those who remain engaged in sport reported traveling, on average, a farther distance to the sport activity than did those who discontinued. Up to a certain distance, traveling to a gym, arena, or field may simply not pose as a deterrent to participation in sport, as it does to participation in physical activity (Davison & Lawson, 2006). This may be due to the formal involvement of parents in youth sport. At the time a youth enters sport, the parent(s) may consciously commit to transporting the youth to the venue. If this is true, than the influence of distance to a sport activity may be observed when measuring uptake of organized sport. It could also be that contextual correlates have a greater association with unorganized sport, such as youth-led 'pick-up' games where parental involvement is uncommon. Further research in needed on unorganized youth-led sport.

Many prominent theories at the interpersonal and intrapersonal levels (e.g., SDT, SCT, TPB) do not readily offer specific predictions as to how environmental variables may be associated with youth sport attrition. Consequently, future research examining environmental influences on sport attrition may need to borrow hypotheses from established relationships within general physical activity literature. For example, Davison and Lawson reviewed 33 studies concerning the environment and PA and found that variables representing access to recreational facilities and access to transportation are positivity associated with PA while traffic density, traffic speed, number of roads to cross, crime and socioeconomic deprivation are negatively associated with PA.

Quality of evidence

Among the 120 correlates categorized as having insufficient evidence, 78 were insufficient due to only being examined by one study. This seems to support Gould's (2007) contention that the study of youth sport attrition is relatively fragmented. Gould (2007) highlights that this fragmentation may be a result of isolated theory and evidence. One avenue that will facilitate theoretical integration is to apply a meta-theoretical framework that can foster linkages between disparate theories, especially linkages that span different analytic levels. One recently proposed metatheory is the evolution-informed approach advocated by Balish, Eys, and Schutte-Hostedde (2013).

Perhaps the most important issue with the satisfactory articles is that all but one of the studies (i.e., Jakobsson et al., 2012) examined sport-specific attrition. Given that the goal of applied sport scientists and organizations that fund sport participation research is to keep youth engaged in at least some form of sport (rather than specific types of sport) future research should examine sport-general attrition (i.e., discontinuing all forms of sport participation).

Another issue with satisfactory articles is absence of information that enables readers to infer the generalizability of the findings. First, the majority of studies (19) did not report the characteristics of their sample and if the sample differed from the population. Second, many studies did not explicitly describe what type of attrition is being examined. Although it could be confidently inferred that all but one study examined sport-specific attrition, this information is important for judging the generalizability of the findings and thus should be stated explicitly. Indeed, as the ultimate aim of this research is to develop an understanding of youth sport attrition that can inform interventions, explicitly describing information for inferring the generalizability of the findings is paramount.

It is also apparent that many studies did not control for, either through participant selection or inclusion of statistical covariates, the competitive level of athletes. Competitive and recreational

sports possess divergent cultures and social contexts and select for athletes with different characteristics (for an overview see Fraser-Thomas, Côté, & Deakin, 2008). In other words, discontinuing recreational sport participation is different than discontinuing competitive sport participation. We highly recommend future research control for competitive level, or examine competitive levels independently.

Another characteristic of the identified articles is the cultural homogeneity of the examined participants. Participant samples in the identified articles (see Fig. 2) were drawn predominantly from what Henrich, Heine, and Norenzayan (2010) describe as WEIRD—western, educated, industrialized, rich, and democratic societies. Henrich et al. (2010) highlight that domains often assumed to be concrete and unchanging are actually variable across cultures. These domains include visual perception, spatial reasoning, self-concepts, fairness, cooperation, and moral reasoning. Cross-culturally, people from WEIRD societies should be considered outliers (Henrich et al., 2010).

Examining cultural variation is important for two reasons. First, cultural variation—or lack thereof—is important for theory development. For example, SDT claims that three aforementioned fundamental needs are reliably developing aspects of human nature and, therefore, should be relatively stable predictors across cultures. Second, the study of youth sport attrition is a normative discipline aiming to facilitate societal change. It should be expected that theories regarding youth sport attrition, which to date have largely relied on research conducted in WEIRD societies, may not generalize to diverse societies. Cross-cultural research will be necessary to move towards a more comprehensive understanding of youth sport attrition and appropriate interventions. However, it may turn out that organized youth sport participation, and thus youth sport attrition, may itself be a culturally specific phenomenon.

Towards a multilevel model of sport attrition

As the study of youth sport attrition advances it will be advantageous to examine interrelations between correlates—to examine potential cofounders, mediators, and moderators (Spence & Lee, 2003). Multilevel models offer a viable statistical method for comparing and contrasting correlates categorized at different analytic levels (Peugh, 2010). A more comprehensive multilevel model would not only unveil important interrelations among levels, but would also better facilitate the comparison of the explanatory value of different analytic levels. For example, to date, most interventions on sport attrition have occurred at the interpersonal levels (e.g., coach education). However, a multilevel approach may suggest that changing the structure of sport (e.g., rules, procedures, and competitive structure) may lead to more meaningful decreases in sport attrition. For example, Burton, O'Connell, Gillham, and Hammermeister (2011) changed the structure, rules, facilities and equipment of a youth flag football league with the aim to (1) increase action and scoring, (2) increase personal involvement in game play, (3) keeps team scores close, and (4) maintain positive social relationships. Compared to the previous season, player attrition decreased 50% (Burton et al., 2011).

This review highlights a number of correlates that may be worthwhile to examine within a multilevel model. At the intrapersonal level, common demographics (i.e., *competitive-level, ethnicity, gender, race, socioeconomic status, weight*) along with *autonomy* and *perceived competence* should be included. At the interpersonal level, *relatedness, presence of friends in sport*, and *positive relationship with the coach* should also be included, as they seem to contribute independent value to predictive models of youth sport attrition. Also at this level, *ego oriented motivational climate, task oriented motivational climate* and *relative chronological* age should be included as they are consistently associated with attrition, or may interact with other variables (i.e., *competitive level*). Although this review did not identify important correlates outside of the intrapersonal and interpersonal levels, the type of school and the size of the community seem promising.

Limitations

This review is constrained by several factors. First, we utilized a scoring procedure that, although does represent the quality and quantity of evidence supporting a correlate, does not specify the magnitude of the association. Future reviews may benefit from using an improved scoring procedure or using more stringent inclusion/exclusion criteria that enables a formal quantitative meta-analysis that would explicitly compare the amount of variance explained by each correlate. Second, to be included in this review, articles must have used a dichotomous (0,1) measure of sport attrition. Consequently, several relatively heavily cited studies that did not use a dichotomous measure of attrition were excluded (i.e., Cervelló et al., 2007; Figueiredo et al., 2009; Robinson & Carron, 1982). Third, this review did not categorize correlates based on their association with gender, competitive level, or type of attrition. Future reviews may benefit from specifically examining these factors. Fourth, this review did not examine interactions among correlates. For example, while Ullrich-French and Smith (2009) found that the quality of relationship with ones mother was not a correlate of attrition, when interaction terms were entered into the regression model, the combination of mothers relationship quality and peer relationships emerged as a significant correlate.

Practical implications

Due to the majority of research on youth sport attrition being conducted at the intrapersonal level, this review converged on several socio-motivational correlates (e.g., autonomy, competence, mastery) as important targets for mitigating youth sport attrition. However, just because these correlates are situated at the intrapersonal level does not mean they are amendable to individual level intervention (e.g., one-on-one consultation). Rather, as the corresponding theory explains (Ryan & Deci, 2000) these socio-motivational correlates are specific cognitions that are not just the product of one's genes, but also and perhaps more importantly, one's social milieu. To change these intrapersonal constructs it will be necessary to change interpersonal level factors, such as an individual's actual social experiences, or perhaps an athletic team's motivational climate (e.g., task-related climate).

While there is an obvious need for more research at higher analytic levels before targeted policies or larger structural changes can claim to be evidence-based, this review did highlight some promising areas. In particular, unearthing the factors that influence attrition rates within different size communities may lead powerful multilevel interventions for decreasing youth sport attrition (see Fraser-Thomas et al., 2010).

Conclusion

This review identifies a number of important correlates of youth sport attrition, many of which are categorized at the intrapersonal and interpersonal levels, measured via self-report, are social in nature, and align with SDT. However, the majority of correlates possess insufficient evidence because they were examined by only one study, perhaps suggesting the study of sport attrition is relatively fragmented. Rather than conducting more exploratory research at the intrapersonal and interpersonal levels, there is a

need for a more theoretically integrated study of youth sport attrition, which may be realized via the application of a meta-theoretical framework. We anticipate this theoretical integration will facilitate productive and efficient branches of research into 'lower' and 'higher' levels of analysis.

In terms of the quality of the articles identified in this review, we suggest future research on youth sport attrition move beyond self-report by considering different data collection methodologies such as observational methods. Employing cross-cultural methods may also be beneficial not only for theory testing but also for practical and ethical reasons. We also suggest that future research explicitly highlights the characteristics of the sample and what type of attrition is being measured, given that different types of attrition may have different correlates or different strengths of association. Finally, there is a need to examine multiple correlates of youth sport attrition within one multilevel statistical model. Doing so may allow researchers to examine possible mediators and moderators that may unveil important locations for interventions to decrease youth sport attrition.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.psychsport.2014.04.003.

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