An Intuitionist Model of Sport Motivation

By

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"Why do human beings behave in ways that are ultimately in conflict with their own health interests? . . . What is responsible for the seeming default status of such tendencies?"

Hall & Marteau (2014, p. 44).

"At first blush, it may seem reasonable to suggest that humans should have an evolved motivation to be healthy . . . However, natural selection is not expected to favor traits that maximize "survival" or "health." Indeed, under many conditions, selection may favor phenotypes that are uncorrelated with or even negatively correlated with longevity and health . . . investments [in health] come at the expense of lifetime reproductive success."

Tybur, Bryan & Caldwell-Hooper (2012, p. 857)

"Biology is destiny, only if we ignore it"

Barkow (2003, p.1)

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ABSTRACT

Despite it's increasingly established benefits, youth sport participation in Canada has declined. Researchers, practitioners, policy and decision makers have all highlighted the need to address declining participation, and that one strategy is to decrease dropout. However, the study of sport motivation has been dominated by "rationalist" models of motivation, claiming that motivation is the product of a rational decision-making process.

The primary goal of this thesis was to develop and conduct initial tests of a novel model of sport motivation within the context of youth sport dropout. This goal was realized though four objectives.

First, a systematic review of the correlates of youth sport attrition was conducted to aggregate what is known regarding youth sport attrition. Results from this review suggested that (a) the majority of correlates occur at the intra- and inter-personal level and align with rationalist models.

The second objective was to develop a novel "intuitionist" model of sport motivation by synthesizing findings from disparate disciplines. This synthesis resulted in a novel, testable model of sport motivation which rests on two main postulates: (1) the mind is composed of regulatory systems that strategically produce intuitions that guide behaviour toward adaptive goals, and (2) intuitions emerging from these regulatory systems use reasoning as a tool to achieve their specific goals.

The third objective was to examine if pride and shame better predict intentions to return to sport than do "basic needs". Results suggested that, in fact, pride, but not shame, predicted intentions to return, and when accounted for, render the associations between "basic needs" and intentions to return insignificant.

The fourth objective tested if prenatal testosterone exposure—as indexed by the ratio of one's second digit to their fourth digit—is related to youth sport motivation, and if this relationship is mediated by feelings of self-assurance. Results from this study confirmed the hypothesized relationships.

Overall, this thesis involved developing and testing a novel intuitionist model of sport motivation that will introduce a greater diversity of predictions, including those that contrast with rationalist models. In light of this intuitionist model, limitations and recommendations for future research are discussed.

LIST OF ABBREVIATIONS AND SYMBOLS USED

2D:4D	Ratio of the length of the 2nd digit to 4th digit
BCa	Bias corrected and accelerated
Beta	Unstandardized beta
CI	Confidence Interval
ISM	Intuitionist Model of Sport Motivation
M	Mean
p	p value
PANAS-X	Positive and Negative Affect Schedule Expanded Form
P_m	Percent of total effect (c) accounted for by indirect effect (a *b)
R^2	Proportion of variance explained
R^2_{adj}	Proportion of variance explained, adjusted for number of explanatory variables relative to data points
SCT	Social Cognitive Theory
SD	Standard Deviation
SDT	Self-Determination Theory
SE	Standard Error
TPB	Theory of Planned Behaviour
B	Standardized beta
χ^2	Chi squared statistic

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Chapter 1 Introduction

Sport is among the most prosperous and viable contexts to facilitate a variety of pro-social assets and experiences, especially for youth (Holt, 2008; Khan et al., 2012). Nonetheless, Canadian sport participation has been in decline and marked gender differences persist. Indeed, youth sport participation in Canada dropped from 77 % to 54% between 1992 and 2010 (Statistics Canada, 2013). The gender gap in sport participation is also increasing over the same timeframe, with now almost 20% more males participating in sport compared to females (Statistics Canada, 2013). Researchers, practitioners, policy and decision makers have highlighted the need to optimize sport programming so as to increase the number of youth playing sport, and extend the duration for which they participate.

One strategy to increase youth sport participation is to reduce the rates of attrition (Gould, 2007). Recent cross-sectional (Boiche & Sarrazin, 2009) and longitudinal (Delorme, Chalabaev, & Raspaud, 2010) data suggest approximately 30% of youth discontinue participation in at least one sport club annually and that attrition is highest during adolescence.

Though there are a number of causal factors that could explain why a child or adolescent discontinues organized sport participation, the vast majority of research on sport attrition has focused on modifiable causes, rather than non-modifiable causes that involve inherent physical or ethical limitations (e.g., one's religious beliefs prohibit sport participation). In particular, studies of sport attrition often center on volitional dropout—when a child or adolescent willfully drops out of sport due to changes in sport motivation.

This thesis follows in this line of work, focusing on the question of volitional dropout, which in turn, situated this thesis within the field of sport psychology.

Definitions of Sport and Sport Attrition

Before describing the objectives of this thesis and its purpose, it is important to define key terms, especially given the myriad definitions and interpretations of sport, both within and across societies. Below are definitions of (a) sport, (b) organized sport participation, (c) organized sport attrition, (d) organized-sport dropout, and (e) youth.

Following Deaner and colleagues (2012) *sport* can be defined as a game involving physical skill where two or more sides compete according to agreed-upon rules. Similarly, *organized sport participation* can be defined as participation in a sport training session (e.g., practice) or game, twice a week for more than three weeks. *Organized sport attrition* can be defined as the discontinuation of organized sport participation—participating in less than two sport sessions per week for three weeks. O*rganized sport dropout* as a sub-class of attrition wherein attrition is attributed to a volitional decision to discontinue organized sport participation due to changes in motivation (Gould, 2007). Finally, I define *youth* as the transition from early adolescence until early adulthood where after the young adult is no longer reliant on their parents for essential means. I quantified this transition as between the ages of 12 and 20 as evidence from western countries suggests an individual's home/parental environment explains the majority of physical activity and sport participation up until the age of 20 (Stubbe, Boomsma, & De Geus, 2005).

The Need for Novel Models of Sport and Exercise Motivation

Though the study of organized sport dropout is situated within the fields of sport and exercise psychology, progress within these fields appears stagnant, if not in disarray.

Although undeniably useful, theories (e.g., self-determination theory; Ryan & Deci, 2000) and models (e.g., sport commitment model; Scanlan, Simons, Carpenter, Schmidt, & Keeler, 1993) of sport motivation have largely served as descriptive typologies. These theories and models have not accounted for types of disparate evidence that bears on the nature of sport and motivation, but also failing to produce novel hypotheses (this is described in chapter 3; also see Balish, Tybur, Rhodes, & Inzlicht, 2015). Indeed, a recent collection of critical comments published by leading researchers in *Health Psychology Review* attests to this state of affairs, with the majority of contributors calling to not only retire prominent theories that are often applied to sport and exercise (see Sniehotta, et al., 2014 and commentaries: Gollwitzer & Oettingen, 2014; Rhodes, 2014; Schwarzer, 2014), such as the Theory of Planned Behaviour (Ajzen, 2011), but also those theories with similar foundational assumptions, such as Social Cognitive Theory (e.g., Bandura, 1998, 2001).

The initial impetus for this study was to advance our understanding of the psychological mechanism(s) that impact youth sport attrition. However, it quickly became clear that there is a need for novel theories and models that can facilitate our understanding of the nature of youth sport attrition by offering novel hypotheses. Given the timing of the previously highlighted calls to retire prevailing theories, one of the necessary tasks of this thesis was to critically assess prevailing theories and models of sport and exercise motivation, to distill their fundamental assumptions (i.e., first principles), and to propose novel models that have different foundational assumptions which can be tested within the context of youth sport attrition.

To distill prevailing theories and models, and to synthesize new ones, it can be useful to develop a term for a class of theories or models with similar assumptions (e.g.,

behaviourism), such that this class can be compared against another class (e.g., behaviourism & cognitivism). Throughout this thesis, specific terms are used to encompass a set of theories that have a similar foundational assumption. As will be further explained in chapter two, prevailing theories in sport and exercise psychology (e.g., SCT, TPB, SDT) are, apparently, built on one foundational assumption: *that conscious reasoning functions as the arbiter of motivation and behavior*. This is described as the *rationalist assumption,* and corresponding theories as *rationalist theories.* It is also argued that the stagnation within the study of sport and exercise motivation, in fact, stems from the widespread acceptance of this assumption. After critically appraising this assumption, a novel model of sport and exercise motivation is introduced. Importantly, this novel model not only contrasts with the rationalist assumption, but also explains the available evidence, synthesizes disparate findings, and generates worthwhile hypotheses.

Developing a novel model of sport motivation was aided by an interdisciplinary approach, which is a powerful yet often neglected and misunderstood approach within the the social sciences (Barkow, 2005; Wilson, 1999). An interdisciplinary approach facilitates theoretical development as it involves synthesizing evidence from neighboring and disparate fields and disciplines. Crudely put, more and different types of evidence from different analytic levels allows researcher to reveal how and why a given phenomenon actually occurs. Throughout this thesis I argue that moving beyond the rationalist assumption (i.e., that motivation for sport and exercise is the sole product of a rational decision making process) requires taking an interdisciplinary approach to the study of sport and exercise motivation (see further Balish, Eys, & Schulte-Hostedde, 2013).

An Interdisciplinary Approach to the Study of Sport Motivation

The study of sport and exercise psychology, situated within the discipline of psychology, is highly amendable to an interdisciplinary approach given it is situated at the nexus of the natural and social sciences. In one direction the natural sciences span to the horizon: a deeply and densely intertwined web of explanations (e.g., evolutionary biology, physiology, genetics), and yet theoretically coherent, if not largely compatible. In the other direction the old silos of the social sciences (e.g., psychology, sociology, anthropology, economics) are slowly dissolving into their own web, and although theoretical coherence across the social sciences is still atypical, this web is slowly being integrated with the natural sciences, and in many cases seamlessly (Barkow, 2005; Wilson, 1999).

Although interdisciplinarity could be perceived as an inclusive, warm, cooperative ideal, in which findings, theories, and ideas from disparate fields are only complimentary, in fact, interdisciplinarity also involves the pruning, and in some cases, outright annihilation of parochial theories that fundamentally contradict relevant evidence from neighboring disciplines. For these reasons an interdisciplinary approach (i.e., synthesizing findings from neighboring fields) may be a powerful approach to addressing the problems with theories of sport and exercise motivation, and in particular, the rationalist assumption. Moreover, it can also help to shift focus toward more novel theories that are otherwise non-obvious within academic silos, such as is the case with sport and exercise psychology (see Balish et al., 2013).

In this thesis I employ an interdisciplinary approach in so far as my theoretical approach incorporates findings from neighboring fields and brings them to bear on theories of motivation for sport. In particular, this thesis builds on a recent blossoming of

of insights from cognitive science, behavioral genetics, evolutionary biology, behavioral economics, sociology, and anthropology, that, together, have generated new insights about the mind and motivation (Barrett & Kurzban, 2006; Barkow, 2006; Daly & Wilson, 1988; Pinker, 2002; Tooby, Cosmides, & Barrett, 2003). Such insights are perhaps best illustrated by the recent paradigm shift in psychology, which has been described as evolutionary psychology (Balish, Eys, & Schulte-Hostedde, 2013; Tooby & Cosmides, 1992; 2005).

Regulatory Systems and Sport Motivation

An evolutionary informed approach to the study of motivation is interdisciplinary given that it requires that models and theories of motivation are complimentary with both the neo-Darwinian synthesis (i.e., evolutionary biology) and the cognitive revolution (i.e., information theory). Following insights from the neo-Darwinian synthesis, throughout this thesis I assume that human motivation is produced, not from a small number of domain-general mechanisms (e.g., a general motivation to be rational, a general motivation to be happy), but rather from a large number of domain-specific mechanisms that evolved to solve specific adaptive tasks (e.g., acquire social status, acquire strategic alliances and friendships, become a member of a formidable coalition). Following insights from the cognitive revolution, I also assume that the mind is a computational organ—an information processing system that takes inputs from the environment, processes them, and outputs some behaviour or regulatory control. Accordingly, models of sport motivation should involve computational constructs at some level.

Taking these assumptions together—that motivation stems from domain-specific adaptations, and that these adaptations are computational in nature—I echo other evolutionary informed theoreticians (e.g., Tooby & Cosmides, 2000) that motivational

adaptations can be understood as systems that regulate the acquisition of a specific resource. Hereafter I describe these motivational adaptations as *regulatory systems*. For an example of a well-established regulatory system, consider the physiological problem of fluid balance and corresponding feelings of thirst (this example is described in more detail in Chapter 2). Is thirst a drive? A goal? A basic human need? While these constructs are phenomenologically appealing, they do little to explain why someone becomes thirsty. Rather, consider that humans have receptors that measure blood osmotic pressure, which send signals (i.e., information) to an internal regulatory variable that is related to the production of feelings of thirst. When blood pressure is low, signals from pressure receptors change this internal regulatory variable such that feelings of thirst are produced. After experiencing the feeling of thirst, individuals then use conscious reasoning capacities to navigate the world (and competing motivations) in a way that allows them to consume potable liquid. The feedback loop is completed when receptors that measure blood osmotic pressure receive feedback, and in turn change the internal regulatory variable such that feelings of thirst are weakened or extinguished. I argue throughout this thesis that understanding sport motivation may benefit from taking an evolutionary informed approach where sport motivation(s) are viewed as conscious signatures of one or more underlying regulatory systems. It should be highlighted that the concept of a regulatory system is not meant to replace those of goals, beliefs, drives, needs, desires, reasons, or the 'self'. Rather, these constructs can be understood as aspects of regulatory systems.

Although regulatory systems are well-established as informative models of how organisms regulate physical resources (e.g., water/thirst, food/hunger, oxygen/suffocation) there are several reasons why invoking the concept of a regulatory

system may be profitable for the study of social motivation in humans, particularly for motivation for sport. First, in terms of natural selection, social resources can be just as critical to reproduction as physical resources. Indeed, in some contexts, acquiring a mate, acquiring status, or becoming a member of a coalition may be more important for reproduction than acquiring food, water, or remaining healthy. Second, when new adaptations arise in which there are previously existing analogues, these new adaptations often co-opt the underlying structure—computational structure in this case—of these previously existing analogues (Wagner, 1996; for an example see Clark, 2010). In evolutionary biology this process is described as serial homology in which the new adaptations are homologues of previous adaptations (Wagner, 1996). It is plausible then, that the evolution of more advanced social motivations would have likely co-opted the computational regulatory structure of already existing "basic" motivations (i.e., hunger, thirst).

Converging evidence suggest that the nature of sport is designed to help individuals evaluate their athletic prowess and assign social status accordingly (Balish et al., 2013; Deaner, Balish, & Lombardo, 2016). From an evolutionary perspective, many theories maintain that humans evolved a motivational system that aims to maximize, maintain and signal social status (e.g., Cheng, Tracy, & Henrich, 2010; Kenrick, Griskevicius, Neuberg, & Schaller, 2010). Given the evolutionary informed approach employed in this thesis, I argue that humans did in fact evolve a regulatory system that serves to maximize, maintain and signal social status, and that it is this 'status system' that produces most of the motivation for sport and sport attrition. Just as quenching one's thirst is experienced as the satisfaction of solving the evolved goals of the underlying regulatory system, feelings of pride and shame are the conscious signatures of the system

that is reacting to increases or decreases in status. Although studying the actual computations of underlying internal regulatory variables for social motivations exceeds the scope of this thesis, studying pride and shame as the conscious signatures of underlying internal regulatory variables may advance our understanding of these emotions, even when conducting basic tests of how they are correlated with important outcomes in sport and exercise behavior, including attrition.

Pride, Shame and the Intuitionist Model of Sport Motivation

All emotions involve the self in some fashion, but pride and shame are specifically considered self-conscious emotions given that they involve self-relevant thoughts, feelings, intentions, and behaviours (Tracy & Robins, 2004; Fisher & Tangney, 1995). The fact that these emotions are at the centre of thoughts, feelings, intentions, and behaviours that concern the self lends credibility to the theory that these emotions are involved in the regulation of one's social resources. For example, converging evidence across a number of fields has linked pride and shame to the regulation of social status (Cheng et al., 2010; Henrich & Gil-White, 2001; Sznycer et al., 2012; Sznycer, Tooby, Cosmides, Porat, Shalvi & Halperin, 2016; Tracy, Shariff, & Cheng, 2010). Indeed, feelings of pride are often elicited when one achieves superiority in a competitive game or sport (Tracy & Matsumoto, 2008), while feelings of shame stem from situations when one loses status in competitive contexts (Tracy & Matsumoto, 2008) or violates a moral norm (Bierbrauer, 1992).

Despite being linked to status striving and sporting contexts, pride and shame have largely been ignored in the field of sport and exercise motivation (for exceptions see Castonguay, Gilchrist, Mack, & Sabiston, 2013; Mack, Kouali, Gilchrist, & Sabiston, 2015). Furthermore, when these self-conscious emotions have been discussed, they have

been considered peripheral to the actual production of motivation—they have been viewed as epiphenomenal by-products of social behaviour (for example see Bandura, 1982; Bandura & Cervone, 1989). This lack of interest—as I argue in chapters 2 - 6—is perhaps due to the widespread acceptance of the rationalist assumption: that conscious reasoning is the primary driver of motivation and behaviour.

In this thesis I propose an Intuitionist Model of Sport Motivation (ISM), which is built on a different foundational assumption: that intuitions emerging from evolved regulatory systems drive conscious reasoning and sport behaviour. In other words, intuition comes first, reasoning second (if at all), and behaviour third. In line with the ISM, I propose that pride and shame are not only at the centre of behaviour change in sport, but that they also function as the conscious signatures of underlying systems that adaptively regulate status striving. These regulatory systems produce intuitions that guide individuals toward actions that achieve their adaptive goals, which in this case is maximizing and maintain one's status. For example, when an young athlete discontinues participating on a local amateur sport team, the initial intuition to discontinue was likely produced by a system that evolved to maximize and maintain one's social status. The underlying regulatory system may have computed—consciously or subconsciously—feelings of potential pride and shame when considering registering for the local amateur sport team. Compare this example with rationalist theories, which assumes that, when an young athlete discontinues participating on a local amateur sport team that she is engaging in irrational behaviour. Somewhere along the way, this young athlete failed to acquire the knowledge or to perform the cost-benefit calculation, given all of the positive outcomes of youth sport participation, and thus made a strategic error by dropping out.

The ISM can be viewed as a response to recent calls for novel models of sport and exercise psychology. However, of course, one doctoral thesis cannot fully validate nor falsify an entire model. As I elaborate in the following section, the second and third chapters in this thesis focused on reviewing the relevant literature, and developing the ISM, while the fourth and fifth concerned preliminary tests of the ISM's basic assumptions within the context of youth sport.

Purpose and Objectives

The primary purpose of this thesis was to employ an interdisciplinary approach to developing and testing a novel model of sport motivation. Realizing this purpose required four objectives, each of which have corresponding chapters. The first chapter reports on a systematic review of the relevant literature regarding correlates of youth sport attrition. Reviewing the relevant literature can reveal not only it's current state, including important correlates, but also limitations and gaps. Understanding both established findings and gaps in the literature can facilitate ways in which to address the problems in the study of sport motivation. The second objective was to build on insights generated from the systematic review by developing a novel model of sport motivation that can (a) explain existing findings, (b) synthesize disparate findings from neighboring fields, and (c) generate novel hypotheses, including those that contrast with the rationalist assumption. If, in fact, much of the problems in the study of sport motivation are attributable to the reliance on a single, potentially false assumption of motivation, then a novel model that makes contrasting claims will, at worst, offer an alternative to prevailing models and thus create opportunities for falsification, and at best, thrusts the field forward by offering a novel model that generates a number of new productive avenues of research. The final third and fourth objectives follow from the first and second as they concern

preliminary tests of the ISM. Specifically, the third objective aimed to test if measures of self-conscious emotions—pride and shame—more strongly predict youth sport dropout than do measures of "basic needs." Demonstrating these predicted relationships will constitute a first step towards testing the accuracy of the ISM and comparing its predictions to contrasting models. The fourth objective also follows from the ISM as it involved examining how prenatal testosterone exposure—as indexed by the ratio of length of one's index finger to their ring finger—is related to youth sport motivation, and how this relationship is mediated by a component of pride, self-assurance. Demonstrating these findings will further test the novel insights of the ISM, including the hypothesized relationships between testosterone and sport motivation.

The following sections of this thesis align with the four previously described objectives, each of which corresponds to a published or publishable manuscript that describes the results of each objective. The thesis closes with a discussion of the objectives as a whole, centering on how the ISM can help advance the study of sport motivation.

Chapter 2 Correlates of Youth Sport Attrition

Correlates of Youth Sport Attrition: A Review and Future Directions.

Balish, S. M., McLaren, C., Rainham, D., & Blanchard C.

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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 et al., 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, Côté, & Deakin, 2005; Gould, 2007).

One intended outcome of this continual redesign is lowered rates of youth sport attrition (Gould, 2007). Recent cross-sectional survey data (Boiche & Sarrazin, 2009) and longitudinal data from sport clubs (Delorme, Chalabaev, & Raspaud, 2010) suggest 30% of youth discontinue participation in at least one sport club annually. In Canada, an attrition rate of 30% equates to approximately 600,000 instances per year in which youth between the ages of 5 and 14 discontinue being a member of a sport club.

Traditionally, research on youth sport attrition has employed correlational designs due to the practical and ethical constraints of constructing externally valid experiments (i.e., interventions) in youth sport contexts. A number of theories of motivation have guided these correlational designs, often in an exploratory manner (i.e., not explicitly testing hypotheses). However, while this focus on correlational, exploratory designs has embraced diverse approaches and has supported a diversity of theories, I echo Gould (2007) in highlighting that the study of youth sport attrition is relatively fragmented. Accordingly, there is a need for a review of the correlates of youth sport attrition to both synthesize findings and map future directions.

There is also a need to situate correlates of attrition within a social ecological model (see Figure 1). Although research on youth sport attrition has traditionally examined individuals and dyads, correlates can—and often do—exist at multiple levels of the human environment (for reviews see Emmons, 2000; Green, Richard, & Potvin, 1996). For example, Fraser-Thomas, Côté and MacDonald (2010) demonstrated that youth living in larger communities may be more likely to discontinue youth sport participation. By encompassing both "downstream" and "upstream" influences on youth sport attrition, social-ecological models should facilitate a more comprehensive understanding of how youth sport attrition occurs within complex human environments, as it has for physical activity more generally (see Spence & Lee, 2003).

Following the guidelines for Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), 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 level of evidence for each correlate. The following

section outlines the methods that guided this review. The review closes with a critical discussion of the results and recommendations for future research.

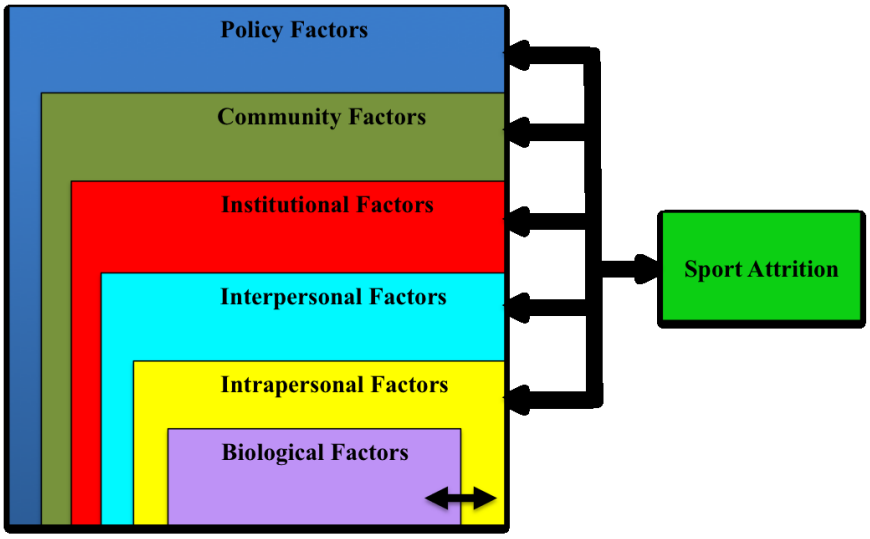

Figure 1. The Social Ecological Model of Sport Attrition. Adapted from Emmons (2000).

Methods

Selection of the Literature

The first author conducted a search using a sequential four-step process among PubMed, PsycINFO, SPORTDiscus, and Web of Knowledge databases (see Figure 2). First, to identify relevant studies 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). Specifically, the search strategy took the form of "sport participation AND [attrition relevant keyword] AND [social-ecological keyword]". In the second step the title and abstract of the identified studies were examined for relevance to the aims of the review. In Step 3 the body of each

study was assessed for the inclusion criteria. To satisfy inclusion criteria, each study must (a) be peer-reviewed, (b) published during or after the year 1980, (c) written in the English language, (d) have more than half of the participants 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. In the last step the reference lists of satisfactory studies were reviewed for additional studies that would meet the inclusion criteria.

Defining Youth, Sport, and Youth Sport Attrition

Following Deaner, Geary, Puts, Ham, Kruger, Fles, et al. (2012*), I* defined 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. I defined youth as *the transition from early childhood until early adulthood where the young adult is no longer reliant on their parents for essential means*. I *quantified this transition as between the ages of 7 and 20.* I chose this definition 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 is broader than previous definitions that describe youth as the period of transition between early adolescence and early adulthood (13-17; Fraser-Thomas & Côté, 2006). Finally, I followed 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). Many sport psychologists are not necessarily interested in what sport youth participate in, but whether they play sport 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—participation in multiple recreational sports (Côté, Baker, & Abernethy, 2007). However, largely during adolescence, in what has been described by Côté, Baker, and Abernethy (2007) as the specializing years, a sub-set of athletes begin to specialize in a limited number of sports—often one—in which participation is characterized by more frequent and intense training and competition. I use competitive level to infer sport specialization as the necessary time commitments and resources required to participate competitively often do not permit participation in other sports. This review examines both sport-specific and sport-general forms of attrition.

Categorization of Correlates

Each sport attrition correlate was categorized at a specific level within the proposed social ecological model (see Figure 1). Specifically, correlates of (subjective or objective) physical measurement (e.g., weight, height, testosterone level) were categorized at the biological level. Correlates that represented a demographic (e.g., ethnicity, age) or psychological trait (e.g., self-efficacy, ego-orientation) were categorized at the intra-personal level. Correlates that represented a subjective or objective measure of relations among social agents (e.g., mother relationship, peer acceptance) were 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, I chose the inter-personal level and noted that such correlates were measured via self-report. Correlates that represented a characteristic of a sporting institution (e.g. co-ed, school-based, club-based, cost of club membership) were categorized at the institutional level; whereas correlates that represented a characteristic of a community (e.g. residential mobility, number of recreational areas, distance to recreational areas) were categorized at the community level. Finally, correlates that represented policy related factors (e.g. economic incentives, gender equity policy, health and safety requirements) were 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.

Quality Assessment

Due to non-reporting of effect sizes and the overall heterogeneity of methods, pooling data was not possible. Accordingly, I followed 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, Verheijden, Cinapaw, & Hop-man-Rock, 2011; Uijtdewiligen, Nauta, Singh, van Mechelen, Twisk, van de Horst, & Chinapaw, 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 study). 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 was categorized into two different levels. Following Koeneman and colleagues (2011), I categorized 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 *strong* if there were two or more mutually consistent (either non-significant relationships found or significant relationships in the same direction) relationships of high quality. Correlates were labeled *moderate* if there were mutually consistent findings in one high quality and one low quality relationship, or two or more low quality relationships. Correlates were labeled *insufficient* if only one relationship examined that correlate, if inconsistent (opposite direction of relationship or significant/non-significant) findings from 'high quality' relationships represented more than 20%, or if high and low quality relationships represented more than 33.4%, of the relevant relationships. To facilitate generating quality index for each correlate, the 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.

Data Extraction and Synthesis

Several questions guided data extraction and synthesis from satisfactory studies:

- 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 most likely 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., Ulrich & Smith, 2009; Burton, 1992) reported two independent statistical tests (e.g., two different regression models) of one correlate (e.g., perceived competence). In such cases I extracted relevant information from the model that included the (a) most predictors and (b) did not include interaction terms.

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	Retrospective
	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.	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) $\geq$.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) $\geq$.70 measure of internal consistency, (b) a correlation of $\geq$.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.	

Results

After removing duplicates, the initial database search resulted in a total of 2133 studies. The title and abstract were then examined for relevance to the aims of the review, resulting in a total of 118 remaining studies. These 118 articles were then scanned for inclusion criteria, which identified 17 satisfactory studies. An additional 6 studies were added from existing reviews, resulting in a total of 23 studies for inclusion in the review. One hundred forty one distinct correlates were examined within the 23 satisfactory studies 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 median of 289, and a range of 12 – 2180. Approximately 4354 (52.17%) were described as male and 3177 (38.07%) as female,

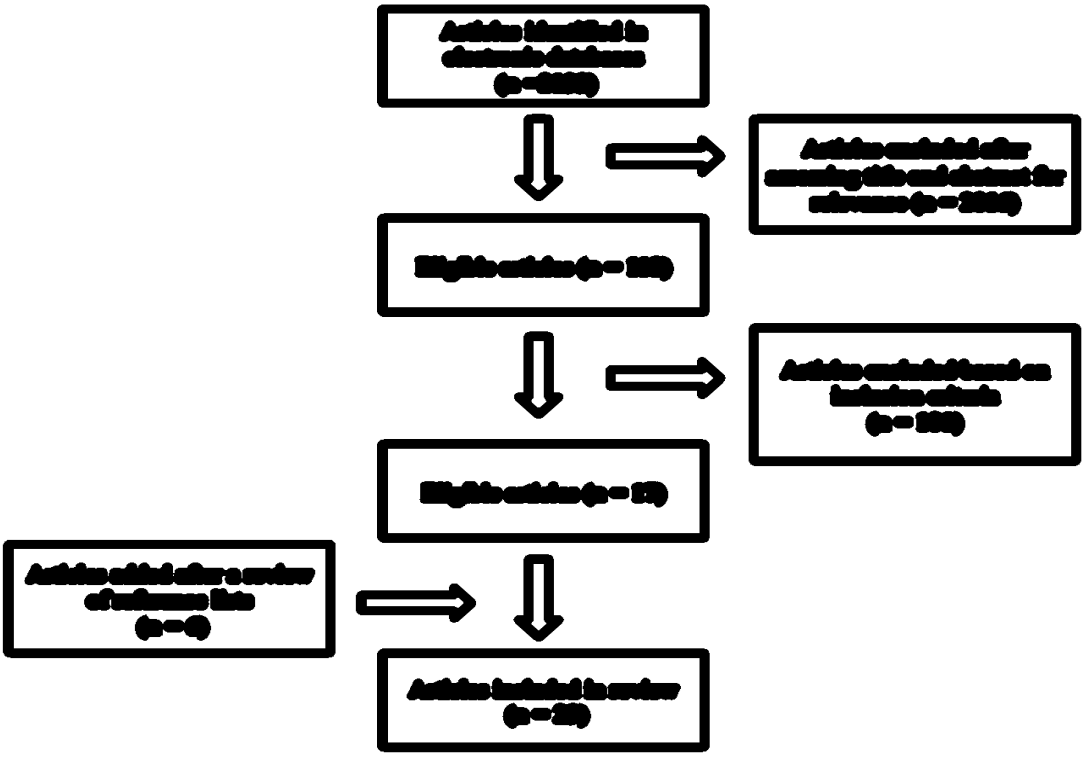

Figure 2. Flowchart of selection process

while 814 were not reported (9.75%). Ages of participants ranged from 7 to 20. Sixteen studies reported examining domain-specific attrition (participation in one sport) while

seven reported examining domain-general sport participation. Sports measured as domain-specific included handball (3), soccer (3), swimming (3), followed by wrestling (2), baseball (1), basketball (1), gymnastics (1), hockey (1), and jujitsu (1). Together, studies sampled participants from eight economically developed countries: France (7), United States (5), Canada (4), Estonia (2), Spain (2), Australia (1), Germany (1), and Sweden (1). Overall, this review identified 11 correlated with strong evidence and 10 with moderate evidence (see Table 2).

Biological correlates

Three variables emerged at the biological level: age (strong 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 strong levels of evidence and 6 display moderate levels of evidence (see table 2). Perceived competence emerged as a strong correlate and is the most examined correlate the reviewed studies. Although two low quality studies report non-significant associations, it should be noted that their measurement of perceived competence is less extensive than those reporting a significant relationship. Other strong correlates included amotivation, autonomy, identified regulation, intention to dropout, intrinsic motivation for accomplishment, intrinsic motivation to experience stimulation, and relatedness. Moderate 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.

Table 2

Correlates of youth sport attrition with strong and moderate evidence.

Strong evidence	Moderate evidence
Age[1] (+)	Attributing success to external sources[2] (-)
Amotivation[2] (+)	Conflict between sport and non-sport
Autonomy[2] (-)	activities[2] (+)
Ego climate[3] (NA)	Coach relationship [3] (-)
Identified Regulation[2] (+)	Intention to participate in sport[2] (-)
Intention to dropout[2] (+)	Intrinsic motivation[2] (-)
Intrinsic motivation for	Peer induced ego motivational climate[3] (NA)
accomplishment[2] (-)	Peer induced task motivational climate[3] (-)
Intrinsic motivation for stimulation[2] (-)	Positive expectancies of future in sport[2] (-)
Perceived competence[2] (-)	Presence of close friendships in sport[3] (-)
Relatedness[2] (-)	Value of activity[2] (-)
Task climate[3] (-)	

Note. 1 = Biological level, 2 = Intrapersonal level, 3= Interpersonal level, NA= No association.

Interpersonal correlates

Forty-three variables emerged at the interpersonal level emerged, two of which are scored as strong and four as moderate (see table 2). Strong correlates included ego climate (no association) and task climate (negative association) while moderate 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 levels of 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 moderate adjusted 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 levels of 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 study examining community size is high quality, statistically significant, and reports a relatively large adjusted odds-ratio (OR = 4.74).

Policy correlates

No policy correlates are reported in the satisfactory studies.

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 strong or moderate levels of 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. 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 Figure 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, height is the only examined biological correlate of youth sport attrition within the satisfactory studies. However, the proposed social ecological model of sport participation 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 (Mazur & Booth, 1998). A number of studies have found links between pre-natal testosterone and sporting behaviour (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 to prefer sports more than females without the condition (Berenbaum, 1999; Frisen et al., 2009).

The absence of moderate or strong biological correlates in this review simply stems from a lack of research. Given that evidence suggests genes meaningfully influence sport participation (Stubbe, Boomsma, & De Geus, 2005), it will be important for future research to examine biological correlates, including the malleability of their effects. The most efficient strategy of unearthing biological correlates 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 is 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 strong correlates and six of the ten moderate correlates, making it the most prominent analytic level within the identified studies. Although a number of these correlates are interrelated and follow from an established theory (self-determination theory), when considered independently some correlates are more descriptive than explanatory. Such correlates include *intention to dropout* (strong), *intention to participate* (moderate), and *amotivation* (strong). Although these correlates do align with phenomenological accounts of the decision to participate in sport (Allender, Cowburn, & Foster, 2006), there is a need to converge on the psychological mechanisms that give rise to these intentions. 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 (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 of intrinsic motivation, including *intrinsic motivation* (moderate)*, intrinsic motivation to experience stimulation* (strong)*, intrinsic motivation to experience accomplishment* (strong)*, perceived value of activity* (moderate)*,* 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" (Deci & Ryan, 2000; p. 68). The results of this review align with SDT's claim for the existence of three fundamental needs; the correlates *autonomy* (strong)*, perceived competence* (strong)*, and relatedness* (strong) were among the most studied of all identified correlates.

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 studies. Perceived *autonomy* (i.e., 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* (moderate) and *positive coach relationships* (moderate), 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, a recent review by Plotnikoff, Costigan, Karunamuni, and Lubans (in press) suggested that while SDT explained the most variance in PA behviour, social cognitive theory (SCT) was also important as it 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 might 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 strong correlates (ego climate and task climate) and four moderate 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 studies.

Ego and task climate (strong) and peer induced ego climate and peer induced task climate (moderate) emerged as four of the six strong or moderate 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, Spray, Harwood, & Lavallee, 2011). 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, Spray, Harwood, & Lavallee, 2011). 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. Indeed, the two studies that did not find an association between ego climate and youth sport attrition solely relied on older athletes who competed at a relatively high competitive level (Le Bars & Ninot, 2009; Jõesaar, et al., 2011). There seems to be two possible expolanations for this non-association: (1) the context of more competitive late-adolescent sport may select athletes whose motivation is not negatively affected by an ego climate, or (2) 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 moderate 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 these agents 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 false 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 studies 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 (2003) 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 levels of evidence, there were a number of interesting findings that warrant future research. At the institutional level, Wattie and colleagues (2012) demonstrated that relative to vocational schools, youth in high academic ability schools are .39 to .41 times as likely to discontinue sport participation. Jakobsson and colleagues (2012) found similar yet statistically insignificant associations. At the community level, Fraser-Thomas and colleagues (2012) demonstrated that the adjusted 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, Turnidge, Hancock, and Côté (2012) 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 travelling to larger communities to participate on more competitive teams. This "differential diminishing opportunities" hypothesis is an avenue for 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 because these schools select students based on academic ability. 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 Boiche and Sarrazin's (2009) prediction, those who remain engaged in sport reported travelling, on average, a farther distance to the sport activity than did those who discontinued. Up to a certain distance, travelling 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 formal parental

involvement is not common. Although there are practical obstacles, further research in needed on unorganized youth-led sport. For example, a case study by Balish & Côté (2013) found that mixed-age, youth-led sport may serve as an important influence on further athletic development.

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 levels of 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) which integrates proximate explanations (i.e., how psychological mechanisms work) with ultimate explanations (i.e., the selective

pressure(s) in the ancestral past that crafted this mechanism). For example, at the proximate level, perceived competence is an important correlate of youth sport attrition. However, ultimate level explanations of sport participation center on status striving (Lombardo, 2012). Integrating these two explanations and supposing proximate level socio-motivational mechanism that evolved to elevate and maintain one's status would not only lead to a number of novel hypotheses at the psychological level (e.g., Do high academic ability schools protect against dropout because sport confers more status in such contexts?) but would also facilitate integration with relevant evidence in neighboring fields. For example, the fact that testosterone is associated with both status and sporting outcomes (see Mazur & Booth, 1998) makes sense when supposing Lombardo's (2012) ultimate level theory that the motivation for sport is produced by a psychological mechanism that evolved (in the ancestral past) to elevate and maintain one's status.

Another issue with satisfactory studies is the non-reporting of information that would enable inferring 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 the type of attrition could loosely be inferred by considering the different types of sport participation being measured, this information is too relevant for judging the generalizability of the findings to state implicitly. As the ultimate aim of this research is to develop an understanding of youth sport attrition that can inform interventions, explicitly describing integral 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). Simply, discontinuing recreational sport participation is different than discontinuing competitive sport participation. I highly recommend future research control for competitive level, or examine competitive levels independently.

Another characteristic of the identified studies is the cultural homogeneity of the examined participants. Participant samples in the identified studies were drawn predominantly from what Henrich, Heine, and Norenzayan, (2010) describe as WEIRD societies—western, educated, industrialized, rich, and democratic societies. Henrich and colleagues (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, Heine, & Norenzayan, 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, therefor, 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 been substantiated from research on WEIRD youth, 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.

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 and colleagues (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, O'Connell, Gillham, & Hammermeister, 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., *age, competitive-level, ethnicity, gender, height, 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, I 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, studies 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, Escartí, & Guzmán, 2007; Figueiredo, Gonçalves, Silva, & Malina, 2009; Robison & Carron, 1985). 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 Ulrich and Smith (2009) found that the quality of relationship with one's mother was not a correlate of attrition, when interaction terms were entered into the regression model, the combination of the relationship quality with one's mother and peer relationships was a significant correlate.

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 levels of 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. I 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 studies identified in this review, I 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. I 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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Note: * = studies included in the review.

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Bridge Section: From a Systematic Review to Theoretical Proposal

This section, chapter one, described a systematic review of the correlates of youth sport attrition. This review was necessary to investigate the current state of the literature on youth sport attrition, and consequently, if it was worthwhile to develop a novel model of sport motivation. Specifically, this review helped to outline not only the most commonly studied correlates, but also the quality of evidence behind each correlate, and how these correlates could be situated at different analytic levels. In particular, the review highlighted that a social ecological approach would benefit the study of youth sport attrition. Results suggested that the vast majority of correlates of sport attrition are situated at the intrapersonal and interpersonal levels, and that most correlates concerned cognitive constructs. Importantly, none of the correlates concerned affective constructs, such as emotions. Given that affective constructs have demonstrated substantial predictive capacity in domains similar to sport, it may be necessary for future research to propose ways in which affective correlates should influence sport attrition. Accordingly, the focus of the next chapter was to propose a novel model of sport motivation.

The following chapter offers a novel theoretical proposal, which first involved distilling the prevailing theories that have been applied to the study of youth sport attrition. Specially, these theories involved self-determination theory, social cognitive theory, and the theory if planned behaviour. Of note, these theories are infrastructural to many of the cognitive correlates used to study sport attrition. After distilling these theories into their basic assumptions, this theoretical proposal then turned to proposing a novel model that contrasted with the basic claims of prevailing models.

Chapter 3 An Intuitionist Model of Sport Motivation

An Intuitionist Model of Sport Motivation

Balish, S. M., Rainham, D., & Blanchard

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Abstract

Objectives: Despite the increasingly established benefits of sport, theories that attempt to explain sport motivation are incomplete. The purpose of this review is to offer a novel Intuitionist Model of Sport Motivation (ISM).

Design: Theoretical review.

Methods: Findings and theories across disciplines were reviewed and synthesized.

Results: The ISM rests on two postulates: First, the mind is composed of multiple goal-oriented regulatory systems that strategically produce intuitions that guide behaviour toward distinct, and sometimes competing goals. Second, intuitions emerging from these regulatory systems "use" reasoning as a tool to achieve their specific goals. This 'reason-as-tool' argument not only contrasts with prevailing rationalist models, which claim that reasoning functions as an arbiter of sport motivation, but also makes hypotheses regarding its functional role in goal-conflict resolution (e.g., deliberation) and rationalization (e.g., excuses). The ISM accounts for (a) demographic patterns of sport motivation, (b) social correlates of sport motivation, (c) biases in reasoning about sport, and (d) findings from neuroscience that demonstrates how emotion and reasoning are intertwined. The review closes with a discussion of how the ISM promotes a re-interpretation of existing findings, and novel avenues of future research.

Conclusions: Ultimately, the IHB highlights why reasoning is motivated (e.g., biased) toward achieving specific goals, and why regulatory systems, via intuitions, are the main drivers of sport motivation.

Sport is both prevalent and universal across cultures (Apostolou, 2014; Deaner & Smith, 2012). With such prevalence, sport has not only become intertwined with local and global economies, but is also increasingly being recognized as public good—a fertile context for promoting pro-social assets and health, especially among youth (Fraser-Thomas, Côté, & Deakin, 2005; Holt, 2008). Indeed, the importance of sport was recognized by the United Nations General Assembly when they adopted a resolution for the "use of sport as a vehicle to foster development, strengthen education, prevent disease, empower girls and women, promote the inclusion and well-being of persons with disabilities, and support conflict prevention and peace building" (United Nations, 2014).

Despite the societal benefits of sport, motivational factors leading to sport participation or attrition are not well understood. Though several independent lines of inquiry have examined the motivational factors related to sport, prevailing theories and models guiding this and similar psychological research have largely failed to explain or synthesize disparate findings, and have also failed to generate novel, stimulating hypotheses that could further reveal the nature of sport motivation and, in turn, guide future interventions and policy (Hall, 2014; Rhodes, 2014; Sniehotta, Presseau & Araujo-Soares, 2014, 2015). Indeed, a recent collection of critical comments published by leading researchers in *Health Psychology Review* attests to this state of affairs, with the majority of contributors calling to respectfully retire prominent theories that are often applied to sport and exercise, such as the Theory of Planned Behaviour (see Sniehotta, et al., 2014 and commentaries), as well as theories with similar foundational assumptions, such as Social Cognitive Theory (e.g., Bandura, 1989, 2001).

Though a number of theories have been used to explain motivation for sport, the vast majority of these models share basic foundational assumptions and thus can be

categorized into one of two main types: (1) rationalist models and (2) dual-process models. *Rationalist models* assume that conscious reasoning (i.e., rational deliberation, planning, cost-benefit analysis) is an arbiter of motivation, and that non-conscious or quasi-conscious intuitions and feelings are peripheral by-products (see Figure 3;for a further discussion see Balish, Tybur, Rhodes, & Inzlicht, 2015). Individuals consciously consult their preferences, weigh possible behaviours against alternatives, and identify an action that can (seemingly) maximally satisfy their preferences, after which motivation is produced (i.e., reasoning guides motivation; see Ajzen, 1991; Bandura, 2001; Ryan & Deci, 2000). In slight contrast, *dual-process models* assume that motivation can either be the product of conscious reasoning or affective intuitions, and that these two basic processes equally compete for behavioural primacy (see Figure 2; Furley, Schweizer, & Bertrams, 2015; see also Evans, & Stanovich, 2013). According to dual-process models, depending on the external elicitors, individuals will engage in conscious reasoning or will experience a more sudden intuition, and that these different processes have different implications for the realization of motivation and behaviour (i.e., reasoning and intuition equally guide motivation). To move toward a comprehensive understanding of sport motivation, I argue that there is a need to re-examine the basic foundational assumptions of rationalist and dual-process models of sport motivation, and to propose a novel model that is built on different foundational assumptions.

The purpose of this proposal is to offer a novel, third type of model—an intuitionist model of sport motivation (ISM)—which claims that multiple psychological systems produce goal-oriented intuitions that, in turn, employ conscious reasoning to help achieve specific goals (see Figure 5). While rationalist models assume that conscious reasoning is the arbiter of motivation, the ISM claims the reverse: Intuitions

are the *carpenters* of motivation in sport, and reasoning is a powerful *tool* used by these carpenters (i.e., intuitions) to build specific products (i.e., achieve specific goals). This "reason-as-tool" argument, as proposed by the ISM, directly contrasts with the rationalist "reason-as-arbiter" claim, and has a number of implications for studying sport motivation and designing behaviour change strategies. In the following sections, I discuss key terms that I use to qualify and compare rationalist, dual-process, and intuitionist models of sport motivation. I then describe these models, including how the ISM can explain disparate findings from different fields and disciplines, and how it generates novel hypotheses. Finally, I appraise the ISM in light of existing literature, address potential criticisms, and then describe how the ISM impacts the interpretation of existing findings, and how it reveals new areas of inquiry into sport participation.

Defining Key Terminology

To qualify and compare types of motivational models that are used to study sport motivation, it is necessary to generalize across these models and use clear and common terminology. To do this, I draw on terminology commonly used in existing intuitionist models to highlight the interplay of distinct psychological processing characteristics (e.g., Balish, Tybur, Rhodes, & Inzchlit, 2015; Haidt, 2001). However, before introducing these terms in the following sections, it is necessary to defend against the supposed dichotomy between emotion and cognition, which I believe is a false dichotomy that can hinder further understanding of motivation in sport. All psychological phenomena, including emotion and cognition, are forms of cognition, that is, information processing. In fact, emotion and cognition seem to be fundamentally intertwined in the brain (Pessoa, 2008). Feelings and intuitions can include thoughts, while thoughts often involve feelings and intuitions, some of which can be characterized

as emotion or intuitions (Inzlicht, Bartholow, & Hirsh, 2015). Traditional views of emotions as irrational and unconscious, and cognition as rational and conscious, are false—emotion and cognition can be both be rational or irrational, conscious or non-conscious.

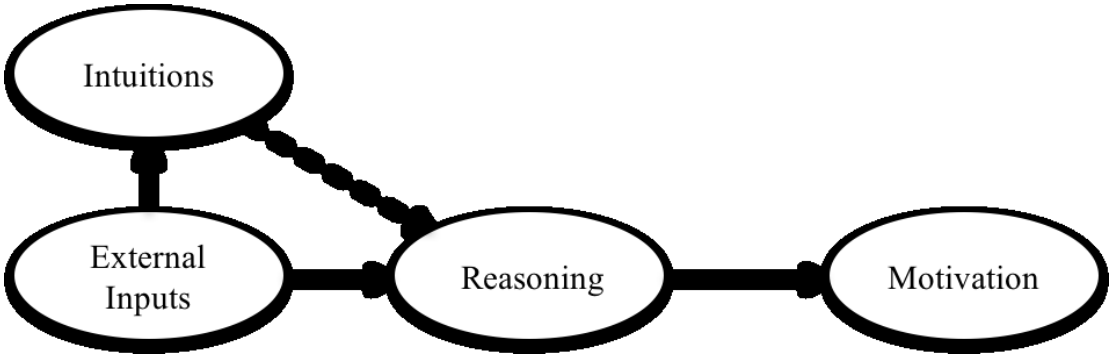

Figure 3. Core assumptions of rationalist models.

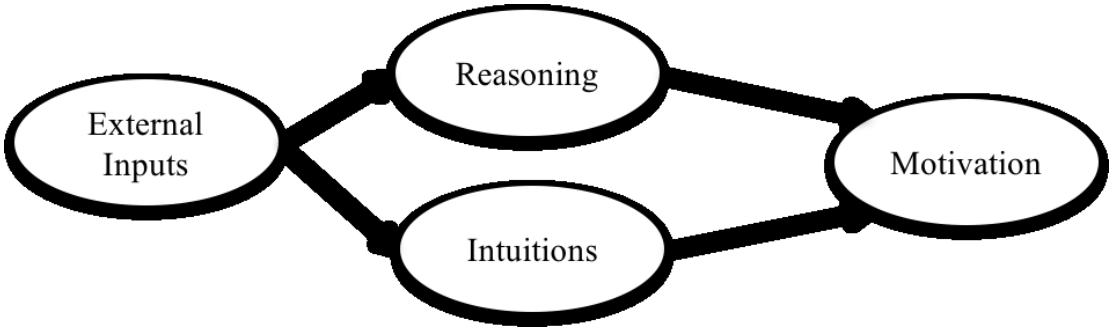

Figure 4. Core assumptions of dual-process models.

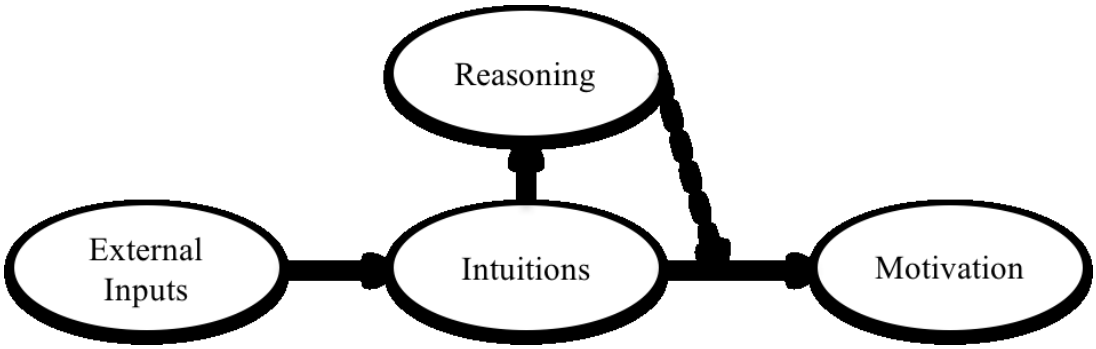

Figure 5. Core assumptions of intuitionist models.

Reasoning. Building on previous intuitionist models (e.g., Balish, Tybur, Rhodes, & Inzlicht, 2015; Haidt, 2001; Huang & Bargh, 2014), I define reasoning as *conscious*

mental activity in which task-relevant information is transformed in a step-wise process in order to reach a desirable plan of action. In characterizing the function of reasoning, I echo Mercier and Sperber's (2011) argumentative theory, which suggests that reasoning functions to achieve adaptive goals, often involving the persuasion of peers. In other words, reasoning is a strategic tool used by intuitions/feelings/motivations to achieve specific adaptive social goals. Notice, however, that this "reason-as-tool" argument does not imply that reasoning is inherently irrational. On the contrary, the ingenuity and clarity with which most people fabricate plausible excuses (e.g., I don't have time to practice today) or plan long-term goals (e.g., I need to do X, Y, and Z to play professionally) are complex and difficult feats that require analytical, coherent, and logical thinking.

Intuition. Again, building on previous intuitionist models (e.g., Balish, Tybur, Rhodes, & Inzlicht, 2015; Haidt, 2001; Huang & Bargh, 2014), I define intuition as *the sudden emergence into consciousness of an energized feeling with an affective valence—approach or avoid, like or dislike—without any awareness of having gone through steps of searching, weighing evidence, or inferring a decision to approach or avoid, like or dislike*. Here, I define intuition broadly given that the terms 'emotion' and 'motivation' are too narrow to capture the phenomenological diversity of feelings that can stem from external elicitors, especially social elicitors. On this view, intuitions represent many forms, including subtle affective nudges (e.g., "that made me feel good"), attention-demanding motivations to perform an action (e.g., "I need to eat!"), and even affectively charged judgments (e.g., "baseball is boring!"). In many cases, intuitions are synonymous with what is commonly conceived of as motivation.

Regulatory Systems. Models that emphasize intuitions should not just explain what intuitions are, but also from where they come. That is, intuitionist models should

describe the psychological systems that produce intuitions, including their information-processing structure (i.e., inputs-processing-outputs). To do this, I follow an evolutionary approach (Balish, Eys, & Shulte-Hostedde, 2013; Cosmides & Tooby, 2000, 2013), which begins with the assumption that humans possess a number of psychological *regulatory systems* that evolved to regulate the acquisition of some adaptive resource, often by generating behaviour-inducing intuitions (for similar claims see Cosmides & Tooby, 2013; Huang & Bargh, 2014; Kenrick, Griskevicius, Neuberg, & Schaller, 2010). For an example of a regulatory system, consider a common intuition: the feeling of thirst. Although one could consider thirst to be a social construction or a fundamental "need" that individuals consciously strive to satisfy, it is better conceived as the output of a regulatory system that regulates fluid balance. This regulatory system implicitly calculates a measure of the body's fluid balance using inputs that signal blood osmotic pressure, which in turn change an internal variable that corresponds to changes in feelings of thirst in the form of intuitions to find and consume potable liquid.

The human body contains numerous feedback-regulated processes enabled by regulatory systems, including those that regulate energy reserves (hunger) and the ratio of oxygen to carbon monoxide stores (feeling of suffocation). However, the ISM posits that such systems also regulate social resources, such as social status (Cosmides & Tooby, 2013). In fact, there is already persuasive evidence for systems that regulate anger (Sell, Tooby, & Cosmides, 2009) and for (down) regulating sexual attraction towards kin (Lieberman, Tooby, & Cosmides, 2007).

Although each regulatory system has a specific computational structure that facilitates the strategic regulation of a specific adaptive resource, there is at least one

common computational element across all regulatory systems that, as Cosmides and Tooby (2000, 2013) have argued, "are not exactly concepts, beliefs, representations of goal states, desires, preferences, or drives, but something else: *internal regulatory variables* along with evolved specializations that compute them and deliver them to evolved decision-making systems" (italics added, p. 218). Internal regulatory variables serve as the intermediary links between environmental cues and corresponding intuitions. As internal regulatory variables are turned up or down, they trigger corresponding intuitions that can emerge into consciously accessible states and guide reasoning and behaviour. For example, the system that regulates fluid balance should include an internal regulatory variable that is affected by measures of blood osmotic pressure. When this internal regulatory variable is "turned up" by measures of low osmotic pressure, it then produces corresponding thirst intuitions (i.e., gut feelings to consume potable liquid). According to the ISM, a comprehensive understanding of motivation for sport requires the mapping a number of regulatory systems, in particular those that regulate the social resources apparent in sport (e.g., status, alliances, cooperative friendships, coalitional dominance).

Prevailing Models Used to Explain Sport Motivation

Rationalist Models

From the 1970's onward, sport psychology—along with the neighbouring fields of health and exercise psychology—rapidly emerged out of their infancy, mainly by adapting models and frameworks from social psychology. At the time, psychology was experiencing the discipline-wide cognitive revolution, wherein rationalist models (e.g., social cognitive theory) presented a thesis that humans are rational creatures (what has recently been described as "Homo Economicus") that navigate the world in an

individualistic and efficacious manner, typically toward actions that maximize their own utility (for a discussion see Persky, 1995). The rationalist paradigm helped inspire models of motivation and behaviour that champion individuals' "freewill" or volition as the dominant causal driver of behaviour. These models are appropriately labeled as "agentic", "planned", or "self-determined." For example, in describing social cognitive theory, Bandura (2001) claims "Agency ... involves ... the ability to give shape to appropriate courses of action and to motivate and regulate their execution. This multifaceted self-directedness operates through self-regulatory processes that link thought to action" (p. 8). Similarly, Ajzen (1991) ends his oft-cited review of the theory of planned behaviour by claiming, "It is at the level of beliefs that we can learn about the unique factors that induce one person to engage in the behaviour of interest and to prompt another to follow a different course of action" (p.206).

Rationalist Postulate One: Reasoning is the Arbiter of Sport Motivation.

Rationalist Models that have been applied to sport motivation assume that individuals consciously regulate motivation for sport by identifying sporting behaviours that will maximally satisfy their preferences, after which motivation emerges (e.g., Vallerand & Losier, 1999). Though rationalist models rarely address what actual mechanism performs the regulating, it is at least implicitly assumed that it is the "self" or the "center of narrative gravity". Accordingly, this rational self (or sub-self) functions as an arbiter—a controller of motivation—and contains a motivational structure that is independent from affective mechanisms and emotions. It follows that, to change sport behaviour, rationalist models assume that one must change the arbiter, either by (a) sharpening reasoning abilities, or (b) providing information that identifies new ways to maximize satisfaction.

Rationalist Postulate Two: Intuitive Influences are Rare and Incidental. Rarely do rationalist models claim that intuitions influence motivation and behaviour, and when they do, these influences are modeled as incidental (i.e., by-products of other functions). For example, when presented with the opportunity to play sport, a young athlete may experience a sudden flash of positive affect related to the opportunity, but this will only indirectly influence her motivation if she consciously recognizes this affective feeling, and incorporates it into her rational calculation of choosing the behaviour that maximizes her satisfaction. Bandura (1989; 2001) explicitly assumed that people infer and forecast their current or future affective reactions (e.g., physiological arousal) as information (e.g., anticipated affect) and then incorporate this information into a rational decision making process.

Dual-Process Models

Dual-process models have been recently applied to sport (e.g., Furley, Schweizer, & Bertrams, 2015), with much of their theoretical appeal attributable to their general heuristic value as generative frameworks for situating intuitive/impulsive processes (i.e., system 1 or type 1) alongside reasoning/reflective processes (i.e., system 2 or type 2). As highlighted by Furley et al. (2015), dual-process models have helped to identify which external elicitors are likely to engage either reasoning or intuitive processes, and how either process impacts the realization of specific motivations and behaviours. Nonetheless, dual-process models have encountered criticisms regarding their worth as productive theories as opposed to common-sense descriptive frameworks for characterizing two common forms of cognitive processing.

Dual-process Postulate: Reasoning and Intuition are Independent. Dual-process models can be interpreted as an extension of rationalist models in so far as they

propose a secondary, and equally influential motivational pathway, from intuition to behaviour. However, regarding the interrelationship between reasoning and intuition, dual-process models make very few claims, and rather hypothesize that it is the context which dictates which process wins motivational and/or behavioural primacy (Furley, et al., 2015).

Intuitionist Models

At its core, an intuitionist approach assumes the mind can be divided into competing regulatory systems that guide reasoning and behaviour via intuitions (see Figure 6). Intuitionism often involves taking an evolutionary approach to the mind in which ultimate-level evolved functions of regulatory systems and the capacity for reasoning are hypothesized in proximately testable ways (i.e., if X evolved to solve the adaptive problem of Y, then mechanism A should produce motivation in these ways; see Balish, Eys, & Schulte-Hostedde, 2013; Keltner, Haidt, & Shiota, 2006). However, this evolutionary approach does not imply that all sport motivation and behaviour is the product of fixed drives bestowed at birth (e.g., the genetic fallacy) or that "natural" motivations are morally acceptable (naturalistic fallacy; see Balish et al., 2013). Rather, like all other adaptations, regulatory systems must develop throughout the human life course and are inherently dependant on external cues (i.e., context). Furthermore, I argue that reasoning is, in some cases, influential and even necessary for producing certain behaviours and achieving certain goals in sport—just as a sharp tool is important for a carpenter to build certain products. In the followings sections I describe two common postulates of intuitionism, both of which concern the functional interplay between regulatory systems and reasoning. Simply put, intuitions occurs first, strategic reasoning second (if at all), and behaviour third (Haidt, 2001).

Intuitionist Postulate One: Multiple Goal-Oriented Regulatory Mechanisms. Participation in sport often involves multiple motivations that compete for a particular decision (e.g., I feel I should I go to the gym, but I want to stay in bed and watch television; I know I should I continue playing sport, but I want to dropout so I can have a better social life). Traditionally, these competing motives were modeled as a tension between irrational affective impulses (e.g., to watch television; to dropout of sport) and rational cognitive deliberation (e.g., go to the gym; continue in sport). In contrast, the ISM views all motives as stemming from competing regulatory systems, some of which trigger reasoning processes more so than others (and thus produce the subjective feeling of intuitive versus reasoning processes). In other words, according to intuitionist models, goal-conflict can be understood at the level of competing regulatory systems (see Figure 6).

To clarify how an intuitionist model offers a novel approach to goal-conflict, consider a young athlete who is asked by her close friend if she would like to train early the following morning before school. A rationalist model might assume that, when this young athlete experiences goal-conflict (i.e., stay in bed versus train), she will perform a cost-benefit analysis of what would maximize her satisfaction, and if she decides to reject her friend's offer and stay in bed, it will be because she believes this act is the most rational choice (e.g., sorry, I have a nagging injury that I need to rest!). A dual-process model would assume that this young athlete has two types of competing psychological processes, one reflective and one intuitive, and that the context determines which process influences behaviour. If the athlete decides to reject her friend's offer and stay in bed, it is perhaps because she has developed strong habits that are triggered by the safety and comfort of her bed.

In contrast, an intuitionist model might assume that both of these competing motives and their associated intuitions—to train with a friend and to stay in bed—stem from competing regulatory systems. The motive to accept her friend's offer to train stems from a system that regulates cooperative friendships—turning down her friend's offer may hurt her reputation as a cooperative friend. The motive to stay in bed stems from a regulatory system that regulates energy reserves and thus produces intuitions to minimize expensive metabolic activity. Because one of these competing motives concerns one's reputation (i.e., as a cooperative friend), this goal-conflict triggers conscious reasoning, which in turn functions to resolve goal-conflict. In this case, the young athlete may use reasoning to fabricate an excuse for rejecting her friends offer—"sorry, I have a nagging injury that I need to rest." This excuse, whether a fabrication or factual, effectively resolves goal-conflict because it (a) preserves her reputation as a cooperative friend (i.e., she couldn't train if she wanted to) and (b) allows her to remain in bed and conserve energy. In sum, this comparison demonstrates that while the rationalist and dual-process accounts provide superficial descriptions of what psychological processes are involved, the intuitionist approach is deeper as it explains (a) the regulatory systems that produced the conflicting intuitions, (b) the ultimate goals of these competing motives, (c) why reasoning occurred, and (d) how reasoning helps to resolve goal conflict via post-hoc rationalizations, and often, fabrications.

It's important to note that, in many cases, individuals are not consciously aware of their regulatory systems and the corresponding goals, though they are aware of their intuitions, which by definition are conscious or quasi-conscious. Just as someone may be aware that they are thirsty, but not aware that their thirst was produced by a system that evolved to regulate fluid balance, many athletes are not aware that their intuitions (e.g.,

"be successful", "to win" and "to improve") in sport stem from one or more regulatory systems that evolved to regulate some social resource (e.g., maximize and maintain social status).

Recently, several consilient theories have been proposed that also invoke evolved regulatory systems (see Huang & Bargh, 2014; Kenrick, Griskevicius, Neuberg, & Schaller, 2010; Leary & Baumeister, 2000; Leary, Tambor, Terdal, & Downs, 1995). For example, Kenrick and colleagues (2010) recently proposed a typology of "fundamental needs" in which they revisited Maslow's classic hierarchy of human needs and proposed an updated version that represents a wealth of recent findings on different regulatory systems that target adaptive resources, many of which are social. These "evolved" motives include parenting, mate retention, mate acquisition, status/esteem, affiliation, self-protection, disease avoidance and other immediate physiological needs (e.g., thirst).

Intuitionist Postulate Two: Reasoning Functions as a Regulatory Tool. What is the function of reasoning? Why would it have evolved among humans? What adaptive benefits did/does reasoning offer, if any at all? Although rationalist and dual-process models do not address such seemingly unrelated questions, such questions matter precisely because an understanding of the ultimate-level (i.e., evolutionary) function of reasoning will generate novel hypotheses regarding its role in enabling motivation, including sport motivation (Balish et al., 2013). At least implicitly, rationalist and dual-process models maintain that the function of reasoning is to improve cognition (e.g., correcting mistaken intuitions) by helping individuals reach better (i.e., more rational) beliefs and decisions (Ajzen; 1999; Bandura, 2001; Ryan & Deci, 2000). This view aligns with reasoning being a rational arbiter that strives to maximally satisfy preferences and desires. More evolutionary-informed versions of the rationalist and

dual-process models hypothesize that reasoning evolved as a single domain-general mechanism that is functionally independent from affective processes (Chiappe, & MacDonald, 2005; for criticisms see Barrett, & Kurzban, 2006, 2012). Although not explicit, an assumption follows from this classical view, that, throughout the phylogeny of the mind, the more recent evolution of reasoning reorganized (i.e., "rewired") all the pre-existing adaptive linkages between socio-affective mechanisms and behaviour such that conscious reasoning is an independent arbiter or judge of behaviour (for a critique of this claim see Huang & Bargh, 2014).

In sharp contrast, the ISM echoes Mercier and Sperber's (2011) Argumentative Theory of Reasoning, which hypothesizes that reasoning did not evolve to shape cognition towards more rational conclusions and decisions, but rather evolved as a device that is used by regulatory systems to convince and manipulate others and to find flaws in other people's arguments. To support their theory, Mercier and Sperber (2011) highlight that (1) reasoning often fails to correct mistaken intuitions, (2) the confirmation bias is universal and largely ineradicable, (3) that reasoning is often and unknowingly "motivated" towards desired conclusions, and (4) that reasoning works best (i.e., converges more closely to truth) in groups composed of individuals with opposed motivations and goals, and worst in groups composed of individuals who share similar motivations and goals.

On this view, reasoning should serve two main functions that impact sport motivation and behaviour: (1) goal-conflict resolution and (2) rationalization. Regarding goal-conflict resolution, deliberative reasoning should occur when individuals experience two competing intuitions. Consider the previous example of the young athlete who has two negative intuitions: (1) she doesn't want to train early the next morning with her

friend, but also (2) doesn't want to reject her friend's offer and be viewed as uncooperative. In such cases of goal-conflict, both intuitions independently engage and use reasoning as a tool to "win" the behaviour that will achieve their goal. However, this "goal competition" is not necessarily a zero-sum game (i.e., if one goal wins, the other must lose). Rather, in many cases, individuals eventually converge on a plausible reason (often an excuse) that achieves both goals. In the previous example, the young athlete told her friend that she cannot train the following morning because she has an injury. In this case, this excuse allowed both conflicting intuitions to "win" given that (1) she stayed in bed, and (2) was not perceived as an uncooperative friend (given that the importance of an injury would have outweighed the invitation to train in the first place). Among the different types of goal-conflict, reasoning should be most influential when reputation-related intuitions are involved, given that reasoning is a social tool that is suited to alter interpretations of events or possible events.

Regarding rationalization, individuals also use reasoning to shape others interpretations of their actions or intentions in a self-serving manner—just as a lawyer may defend a client, or how a press secretary might handle a political scandal. In other words, individuals use reasoning to regulate their own social resources by shaping external perceptions in a strategic fashion. For example, when asked why one dropped out of sport, an athlete will likely respond with a plausible self-serving reason, or excuse, that portrays her in a positive fashion (e.g., I decided to focus more on school), even though the actual reason may be different (e.g., not being talented enough to receive sufficient playing time). It's also important to note that reasoning is often used to deceive oneself, often to create a self-serving, internal narrative regarding intentions or actual behaviour. For example, when asked to report intentions to train for an upcoming championship, an

athlete may feel an intuition to respond in a socially desirable fashion (e.g., strong intentions to train), and then use reasoning to justify these intentions to herself, the researcher, and then honestly believe these reasons as factual.

An Intuitionist Model of Sport Motivation

In the following section I offer an intuitionist model of sport motivation that is adapted from a previously proposed model in health (see Figure 6; Balish, Tybur, Rhodes, & Inzlicht, 2015) and an established model in social psychology (Haidt, 2001), but focuses specifically on sport motivation. I suggest that the addition of intuitionist models to the field will powerfully enhance the ability to explain disparate findings, and will promote the testing of contrasting predictions between models. Below I outline specific linkages within the ISM that correspond to the previously discussed postulates of intuitionism, but are adapted to sport.

Link # 1: The auto-motive link. The auto-motive link corresponds to the claim that intuitions, emerging from regulatory systems, drive sport motivation and behaviour. These intuitions can be subtle affective feelings or fully conscious motivations—either way, in many cases, they directly shape behaviour. Many motivations in sport emerge in the absence of conscious reasoning. For example, the decision to attend practice may not involve conscious deliberation if it is habitual. In fact, structuring activities to make them habitual has been proposed as one way to increase persistence in physical activities that might otherwise require mentally effortful decision-making (Lally, & Gardner, 2013). More obvious examples of the auto-motive link involve outbursts of anger in sport (e.g., reacting to an opponents moral violation) or aspirations to be successful upon being notified of an athletic opportunity. In sum, the auto-motive link builds on Bargh's and colleagues (1999, 2001) auto-motive model

and concerns how intuitions can directly influence behaviour in the absence of conscious reasoning and awareness.

Link # 2: The motivated reasoning link. Although intuitions emerging from regulatory systems can directly influence behaviour, in some cases one or more intuitions engage reasoning and use it to achieve the adaptive goal(s) the intuition(s) are targeting. For example, when considering dropping out of sport, an individual may experience an intuition that dropping out may hurt her reputation as a reliable and athletic person. In this case, reasoning is inherently motivated towards one of more adaptive goals, given that it is guided by one of more regulatory systems.

It should also be highlighted, however, that reasoning can also be used by one regulatory system to manipulate another regulatory system. In other words, individuals can self-regulate. In some contexts and for some individuals, intuitions can be manipulated via conscious reflection or imagery (i.e., the application of reasoning processes to imagined intuition-relevant scenarios). Indeed, a wealth of research in sport psychology has demonstrated the benefit of imagery (see Martin, Moritz, & Hall, 1999 for a review). In these scenarios however, it is important to note that, ultimately, it is one regulatory system (or "sub-self") attempting to manipulate another regulatory system. Furthermore, such manipulation may be largely ineffective, given that regulatory systems evolved to be contingent on specific external cues, not imagined scenarios.

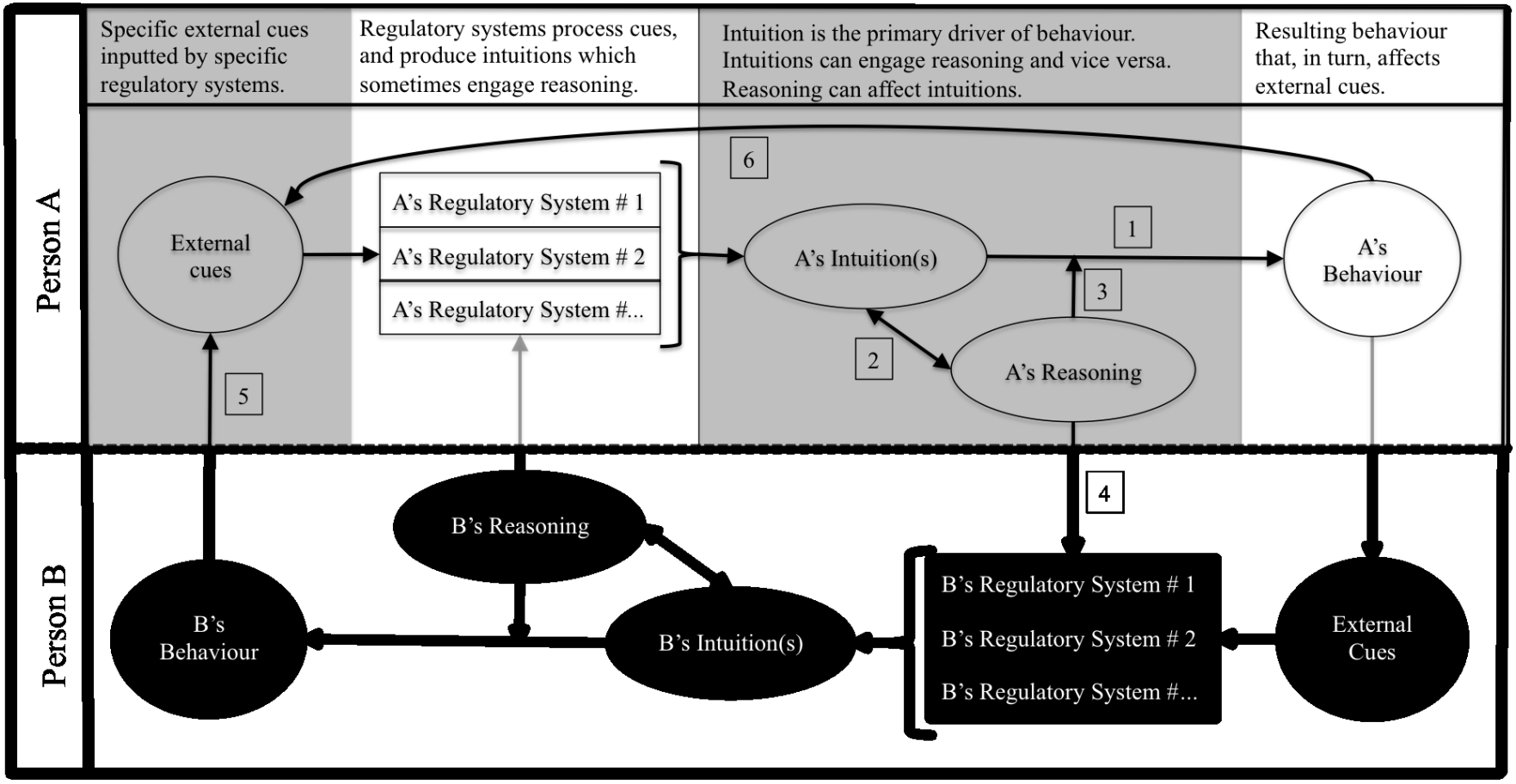

Figure 6. An Intuitionist Model of Sport Motivation adapted from Balish, Tybur, Rhodes, and Inzlicht (2015) and Haidt (2001).

Link # 3: The reasoned regulation link. One of the primary functions of reasoning, according to the ISM, is it helps solve goal-conflict. Two ways to resolve goal conflict are to (1) up-regulate one intuition, so it wins behavioural primacy, or (2) to inhibit one intuition, so another can flourish. For example, an athlete may consider skipping a practice out of laziness, but then may worry that the reputational cost of doing so may be high. In this case, the individual may think that the cost of skipping is too great, wherein the motive regarding one's reputation will inhibit the motive to skip practice. Where traditional portrayed emotion regulation as a conscious top-down process, the ISM argues that ultimately regulating intuitions is performed by other intuitions, given that reasoning is a tool for regulatory systems.

Link # 4: The reasoned manipulation link. The second main function of reasoning is rationalization, and this often occurs to persuade others of some feature of oneself or one's behaviour, even if others are not directly present. For example, an athlete may want to persuade a coach that the reason they were late for a practice is not because they did not value the team and the coach's authority, but that they simply made a mistake and slept through their alarm—whether it is true or not. The reasoned manipulation link can also be used, not just to alter perceptions of one's self, but also of others. That is, reasoning can be used as a tool to manipulate the social resources (e.g., status) of others. For example, an athlete may use reasoning to reveal the inaccuracy of others rationalizations, or, more directly, devalue another by casting insults or voicing disparaging claims. The reverse is also true, however, that reasoning can be used to help others and to build their social value, often, if not always, with the aim of building a friendship, alliance or acquiring some other social resource.

Link # 5: The social persuasion link. The social persuasion link represents how regulatory systems are inherently contingent on external cues, many of which are social in nature. Furthermore, the informational signal of a cue (e.g., norms) can change across contexts, thus allowing different contexts to generate fundamentally different behaviours. That is, different cues across different contexts may offer similar routes to achieve the goals of regulatory systems. For example, within one team, a coach may incentivise a willingness to sacrifice for the team, while another may incentivize selfishness. Within a team that incentivizes sacrifice, one route to gain status may be to sacrifice, while the same may be true for selfishness on a team that incentivizes selfishness. The social persuasion link also captures the development of regulatory systems in which they attach informational value to specific cues. For example, growing up in an eastern culture, such as India, in which the moral norms of loyalty and authority are important, may lead athletes to have different moral concerns than those growing up in a western culture where harm and justice are more dominant (Balish & Caron, 2015).

Link # 6: The niche construction link. The niche construction link represents the ways in which individuals can shape their own and others environments—and the external cues within them. For example, if an athlete knows that they struggle to wake up early and train, they may ask a friend to join them. Thus, when they wake up and attempt to resolve their goal conflict (staying in bed vs. training), the reputational cost of not attending is increased, and thus tips the balance in favour of attending. Another example may be when a coach wants to change the disadvantageous norms (i.e., culture), and does so by incentivising more positive norms.

Core Phenomena to Explain

In the following sections, I highlight four key phenomena that need to be addressed by any psychological model of sport motivation. These include (1) demographic patterns, (2) social factors within sport, (3) biases in reasoning, and (4) neuroscience on the interplay of reason and emotion.

Demographic patterns. Two of the most established findings in the study of sport participation are (1) age effects and (2) gender effects. Regarding age effects, regardless of what type of sport is examined, preferences for, and participation in sport rise sharply in the early years, peak during adolescence, and slowly decline throughout the rest of life (Apostolou, 2014; Balish, Rainham, & Blanchard, 2014). For example, survey data from 32 countries (n = 49,729) suggests that, relative to those over the age of 60, those 15 to 30 years of age are nearly seven times as likely to participate in sport, those 31 to 45 are more than three times as likely, and those 46-60 are almost twice as likely (Balish, Deaner, Blanchard, & Rainham, 2015). The ISM explains age effects, including their apparent universality, by focusing on the evolved design of the regulatory systems that motivate sport behaviour. Recall that regulatory systems are designed to regulate some adaptive resource. From an evolutionary view, one of the most important social resources throughout human evolution was social status (Cheng, Tracy, & Henrich, 2010), mainly because it leads to the acquisition of higher quality and quantity of mating partners (for a discussion see Deaner, Balish, & Lombardo, 2015). Thus, if mate acquisition (e.g., sexual selection) is the main selection pressure that presumably shaped the system that regulates the acquisition of status (the status system), then this status system should produce status-striving motivation during the years when mate acquisition is most important—during the emergence of sexual maturity and into

young to middle adulthood—which is exactly the developmental span when sport motivation peaks. Regarding sport attrition, which also peaks during late adolescence (for a discussion see Balish et al., 2014), it follows from an evolutionary informed approach that, as competition increases during adolescence and differences in athletic ability become more obvious, individuals dropout to strive for status in some different context.

Regarding gender effects, males report stronger preferences and greater participation in sport in every society where relevant data exists (Deaner, et al., 2015). Whether measured in frequency of participation or total duration, males generally participate at least twice as much as females (Deaner, et al., 2015). Although rationalist models of sport motivation have implicitly assumed these gender effects are due largely to socialization (e.g., systematic female oppression), the fact that males are substantially over-represented relative to females across the world—even when controlling for countries' gender equality (Balish, Deaner, Rainham & Blanchard, 2016)—suggests that, at least in part, this gender effect is due to evolved predispositions. The ISM accounts for this gender difference by, again, focusing on the evolved nature of regulatory systems. Given that males and females encountered different selection pressures regarding acquiring high-quality mates, males and females should reliably develop different regulatory systems, just as they reliably develop different reproductive organs. Specifically, stemming from theories of differential parental investment, acquiring physical prestige (i.e., freely conferred status) and dominance (e.g., status ascertained by threat of imposing costs), benefitted males more than females in terms of genetic fitness (see Apostolou, 2014; Balish et al., 2015; Lombardo, 2012; Deaner et al.,

2015). Importantly, ISM can also account for subtle social-cultural influences (e.g., the social persuasion link) that could also impact gender differences in motivation, such as socially rewarding males more than females for sporting success (for a discussion see Deaner et al., 2015).

Social factors. Systematic reviews of the correlates of sport participation and dropout suggest that the most established correlates are social in nature (Balish, McLaren, Rainham, Blanchard, 2013; Crane & Temple, 2015). For example, perceived competence (or self-efficacy) is consistently and strongly associated with motivation for sport (e.g., Jaakkola, Ntoumanis, & Liukkonen, 2015). However, in contrast to rationalist interpretations of self-efficacy, there is growing evidence that this measure is, in fact, confounded by motivation—just as would be predicted by intuitionist models (Williams & Rhodes, 2014). Inline with this "self-efficacy-as-motivation" argument, increasing the rewards to perform a task increases one's self-efficacy, and this occurs for both sport (e.g., free-throw shooting in basketball) and health related tasks (quitting smoking; Corcoran & Rutledge, 1989). Further, simply adding the words "if you really wanted to" to the end of questions that measure self-efficacy (e.g., "Can you successfully exercise for 30 minutes per day, *if you really wanted to*"), not only increases mean values for exercise related self-efficacy, but also decreases the strength of the relationship between self-efficacy and exercise intentions (Rhodes & Blanchard, 2007; Rhodes & Courneya, 2003, 2004). Although rationalist models struggle to explain these findings, they align with intuitionist models in which motivation is assumed to guide reasoning.

Another line of converging findings centres on the functional role of pride in sport. Though the motivational role of pride in non-sport contexts is increasingly being

demonstrated (e.g., Mack, Kouali, Gilchrist, & Sabiston, 2015; Sabiston, Brunet, Kowalski, Wilson, Mack, & Crocker, 2010; Williams & DeSteno, 2008), recent findings have shown that pride and status are deeply intertwined within sport. For example, not only do people accurately predict the status of atheltes based on their behavioral pride expressions (Martens, Tracy, & Shariff, 2012; Shariff & Tracy, 2009; Furley, Moll, & Memmert, 2015), but also teammates' rankings of their peers' status accurately align with those peers' self-reported pride dispositions (Cheng, et al., 2010). Further, recent evidence from both sport and non-sport domains suggest pride plays a functional role in achieving success—just as would be predicted if pride was a conscious signature of a regulatory system that strategically regulates status. Weidman, Tracey and Elliot (2015) longitudinally tracked competitive long-distance runners, and found that while those who performed well felt greater pride, those who felt low pride actually changed their behavior by improving their performance in later races. Interestingly, the opposite was true for self-efficacy—those who reported low self-efficacy did not change their behavior and improve performance. In a similar study, Williams and Desteno (2008) found that inducing feelings of pride actually promotes persistence in a cognitively laborious task, while increasing self-efficacy or happiness does not. Finally, pride is a universal, evolved emotion that is inherently intertwined with status striving (Anderson, Hildreth, & Howland, 2015). For example, the spontaneous behavioral expression of pride (i.e., expanded posture, head tilted slightly back, arms akimbo with hands on hips or raised above the head with hands in fists) is tied to the universal, fundamental motive of acquiring status (Anderson, et al., 2015), is expressed by children as young as three years old (Belsky & Domitrovich, 1997; Lewis, Alessandri, & Sullivan, 1992; Stipek, Recchia,

& McClintic, 1992), and by elite level athletes, including congenitally blind athletes from different cultures and who thus could not have learned the expression through visual modeling (Tracey & Matsumoto, 2008). In sum, this evidence suggests that pride is a conscious output of a system that regulates status striving.

Motivated reasoning. There is converging evidence within sport that reasoning is biased by goal-oriented regulatory systems. For example, Gilovich (1983) found that when participants were oriented toward a "fluke" event in a replay of an American football game they had wagered on and had lost, they interpreted the fluke as more impactful on the game and helped to restore their perception of the team's ability (and the legitimacy of their original wager). However, those who bet on the team that won were largely unaffected by the fluke event—they perceived it to be irrelevant to the outcome. Gilovich (1991) describes that when confronted with unfavourable information, people often take a "must I believe" stance and become overly critical of the corresponding evidence. However, when confronted with favourable information people often take a "can I believe" stance and accept corresponding evidence almost at face value. This demonstrates how reasoning is used in a self-serving manner to justify and rationalize one's intuitions or goals.

Another form of motivated reasoning within sporting contexts is the self-serving attribution bias: people often attribute their failures (e.g., missing a crucial goal attempt) to the situation or context, yet successes to their ability or disposition, thereby constructing more favourable self-referenced beliefs (i.e., athletic ability). The self-serving attribution bias is perhaps the most studied form of motivated reasoning within sporting contexts. Self-serving attributions are universal (or near universal) yet variable

across ages, contexts, and genders (Mezulis, Abramson, Hyde, & Hankin, 2004). Interestingly however, such self-enhancement biases seem to be moderated by reputational concerns. For example, Schlenker, Weigold and Hallam (1990) found that self-serving attributions are more self-enhancing when participants are both motivated to impress others and have the opportunity to voice their attributions in front of the audience. Similarly, Sedikides, Herbst, Hardin and Dardis (2002) found that requiring participants to justify and explain one's self-beliefs decreased the tendency to self-enhance and that this effect was likely due to participants' perceived identifiability. This more directly demonstrates how social intuitions or goals guide reasoning processes, which is a fundamental claim by intuitionist models.

Not only do people arrive at self-enhancing conclusions when reasoning about themselves, but also concerning those who influence their goals (e.g., teammates). Klien and Kunda (1992) subjected participants to a trivia (non-sport) game in which they viewed a player that would either be their teammate or their opponent. After viewing this player perform flawlessly, participants who expected the player to be his or her teammate judged the player as more competent than those who expected the player to be their opponent. People are also biased to reach favourable conclusion about the groups or categories to which they belong. In a similar study, Babad and Katz (1991) demonstrated that people are predictably over-confident in their preferred team's ability and thus act against their own financial interest when making financial wagers on contests that include their preferred team, even when explicitly instructed to be as objective as possible (Babad & Katz, 1991). Again, these findings further cement the fact that social intuitions drive reasoning processes in sport, rather than the reverse.

Reasoning requires intuition. The ISM also aligns with recent findings from neuroscience suggesting intuitions are necessary for reasoning, including such seemingly volitional abilities as cognitive control (i.e., self-control). Cognitive control refers to processes that enable flexible behaviour depending on current goal states. Hereafter, I consider cognitive control as akin to reasoning insofar as it enables deliberation, including the inhibition of dominant intuitions or more general response tendencies (e.g., Link #3: Reasoned regulation link).

First, as highlighted by Inzlicht and colleagues (2015), cognitive control is initiated by goal conflict. Evidence from both non-human animals and human pharmacological designs suggest that the inhibition of behaviour emerges from conflict between different motivational systems (Gray & McNaughton, 2000), such as when an athlete would consider dropping out of sport because she is not successful, but wants to remain friends with her teammates. Indeed, both cognitive neuroscience (Botvinick , 2007; Botvinick, Braver, Barch, Carter, & Cohen, 2001) and social psychology theories have long modeled conflict as a central instigating factor for cognitive and behavioural control (e.g., Carver & Scheier, 1982).

Second, goal conflict elicits negative affect (e.g., Zanna & Cooper, 1974). For example, goal conflict is often induced via the Stroop task and includes feelings of anxiety and frustration (Inzlicht & Al-Khindi, 2012; Saunders, Milyavskaya, & Inzlicht, 2015), but also increased activity in the sympathetic nervous system (e.g., elevated blood pressures, elevated respiration, sweating, and circulating norepinephrine (Hajcak, McDonald, & Simons, 2003; Hoshikawa & Yamamoto, 1997). These sorts of conflicts

also evoke quick changes in facial musculature associated with frowning and the experience of negative emotion (Elkins-Brown, Saunders, & Inzlicht, in press).

Third, the negative affect that accompanies conflict is not a passive by-product (i.e., epiphenomenon) but rather is crucial for behavioural control (Bartholow, Henry, Lust, Saults, & Wood, 2012). Perhaps the most persuasive evidence comes from studies that find, that when negative affect is decreased via rewarding participants after error trials that involve conflict, post-behavioural adjustment on small experimental tasks is stunted (Van Steenbergen, Band, & Hommel, 2009), thus suggesting the negative affect is crucial for control. Similar studies find that amplifying negative affect by punishing errors increases the magnitude of the error-related negativity (i.e., an evoked brain signature associated with negative affect) and improves post-behavioural adjustment (Riesel, Weinberg, Endrass, Kathmann & Hajcak, 2012). In fact, increasing people's sensitivity to their internal feelings states (but not thinking states) protects cognitive control from the deteriorating effects of fatigue (Saunders, Rodrigo, & Inzlicht, in press). Finally, psychological manipulations that reduce negative affect seem to impair cognitive control (Hobson, Saunders, Al-Khindi, & Inzlicht, 2014). For example, changing cognitive appraisals and attributions reduces both error-related negativity and cognitive control (Hobson et al., 2014; Inzlicht, & Al-Khindi, 2012).

In sum, cognitive control is (1) central to the functioning of reasoning, (2) emerges from goal-conflict, and is (3) critically dependent on negative affect. Rather than reasoning as an independent arbiter of motivation and behaviour, this evidence supports the central claim of the ISM that reasoning is a tool that is guided by emotional processes (e.g., intuitions) produced by regulatory systems.

Future Research

The ISM offers a novel way of conceptualizing how and why motivation for sport occurs, and does so by (a) synthesizing findings from disparate fields and disciplines, and (b) offering novel hypotheses regarding new and existing avenues of research. The following sections highlight how the ISM offers a novel interpretation of current avenues of sport psychology, including (a) a possible over-estimation of socialization and (b) naïve interpretation of self-report measures. I further highlight novel areas of research, including (c) mapping the information-processing structures of different regulatory systems, (d) experimental manipulation of intuition and reason, and (e) biological influences on motivation for sport.

Over-Estimating Socialization?

Where do preferences come from? Given the widespread adoption of rationalist model of motivation—which ignore the possibility of preferences being evolved pre-dispositions—most prevailing sport psychology research has assumed only one option: preferences are socialized. This is problematic, given that sport psychology is an applied behavioural science that is specifically focused on developing interventions and policies to improve society. If researchers reject, a priori, the possibility that preferences stem from evolved predispositions, it follows that researchers will not test these alternative hypotheses and thus overestimate socialization effects. In turn, this over estimation may lead to interventions and policies that, at best, waste resources, and at worst, actually thwart sport participation and personal development. For example, the assumption that youth who engage in deliberate play during childhood will develop intrinsic motivation that fosters sport participation at later ages (see Cote, Lidor, & Hackfort, 2009) is

entirely plausible, but translating this claim into policy recommendations should first require rigorous evidence that includes ruling out plausible alternative explanations (Sanderson, 2002).

For example, correlations between play behaviour and participation at later ages could be due to an unknown, common third factor. Perhaps individuals who engage in sport-related play behaviour at early ages are also more athletically talented, and this talent leads to motivation to play multiple sports and at later ages. It's worth noting that this example of a yet untested claim of socialization—that engaging in play behaviour throughout development leads to intrinsic motivation at later ages—has been published as a position stand by International Society for Sport Psychology, even though alternative explanations have not been tested (Cote, Lidor, & Hackfort, 2009). In this case, it turns out there is strong evidence for a role of a third factor: both play behaviour (Berenbaum & Beltz, 2011) and playing competitive sport at later ages (Hönekopp & Schuster, 2010) have been linked to pre-natal testosterone exposure (see also Deaner et al., 2015).

Overall, achieving the ultimate aim of sport psychology—developing interventions and policies to improve how sport occurs in society—requires testing (often unappealing) alternative hypotheses that concern evolved predispositions, many of which may now be more apparent with the advent of the ISM.

Re-examining Self-Report

Epistemological problems with naively relying on self-report have long been recognized in psychology (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Podsakoff & Organ, 1986). However, rationalist models seemed to have preserved a reliance on

self-report by assuming that motivation is the product of a conscious, rational decision-making process (i.e., that reasoning is an arbiter). In other words, if you want to know how and why athletes do what they do, you should be able to ask them given that they consciously regulated their behaviour.

However, if the ISM is true that reasoning is a tool that is used by regulatory systems to achieve specific goals (e.g., status) then athletes may not know exactly why or how they do what they do, and further, may fabricate self-serving reasons for their behaviour and consciously believe their fabrications to be true (Von Hippel & Trivers, 2011). Recall that measures of self-efficacy seem to be confounded by motivation (Williams & Rhodes, 2014) and that the self-attribution bias is near universal and unconsciously moderated by reputational concerns (Mezulis et al., 2004).

If the ISM is true then it may be necessary to further reconsider the face-value of self-reports and to question if certain constructs are actually driven by underlying intuitions. Consider for example, a body of research that has focused on coach-initiated motivational climate, which refers to "individuals' composite views concerning the situationally emphasized goal structures operating in an achievement setting" (Duda, 2001, p. 144). Within sporting contexts, there are usually two commonly characterized motivational climates. The first is a *task-oriented climate* where perceptions of success follow from evaluations of progress and learning (i.e., self-referenced). The second is an *ego-oriented climate* where perceptions of success follow from evaluations of superiority among peers and teams (i.e., peer-referenced). Motivational climate—which has been studied as an athlete's perception—is commonly measured by simply asking athletes how their coach contributes to an ego or task climate.

However, in light of the ISM, perceptions of motivational climates may be confounded by reputation management motives that aim to promote or insulate an individual's status when the coach has acted in a way such that the athlete's status has increased or decreased, facilitated or stalled. In other words, athletes strive for status in sport, and the coach plays a major role in regulating the ability of athletes to strive for status (e.g., providing playing time). If a coach hinders an athletes status striving (e.g., providing very little playing time) that athlete may experience negative intuitions regarding the coach, and thus report an ego motivational climate. This is an example of how it should be necessary to test the basic assumptions of seemingly rationalist constructs.

Mapping the Computational Structure of Regulatory Systems

The ISM may shift research towards more of a focus on the intuitive basis of motivation in sport, which has already occurred for health behaviour (DeSteno, 2009; DeSteno, Gross, & Kubzansky, 2013). In particular, the ISM focuses on the specific computational structure of regulatory systems (for examples of existing regulatory systems see Lieberman et al., 2007; Sell et al., 2009). Recall the ISM posits that motivation for sport is produced by several different regulatory systems, each of which have different inputs, processing, and outputs. Accordingly, mapping these systems is necessary to develop a comprehensive account of sport motivation. For example, one central system involved in sport motivation should be a "status system" which presumably evolved to maximize, maintain, and signal one's social status. Such a regulatory system should assess a given task and produce motivation depending on the processing of specific inputs including (1) likelihood of being successful in the task, (2)

status benefits of being successful, (3) status costs of failing, (4) and opportunity costs (for similar arguments see Leary & Baumeister, 2000; Leary, Tambor, Terdal, & Downs, 1995).

Experimental Manipulation of Intuition and Reasoning

One of the main benefits of the ISM is that its foundational assumptions differ from rationalist models, and thus should facilitate experiments in which these competing assumptions are tested. Although the common methods of testing competing models of motivation in physical activity settings involve comparing their predictive prowess, experimental testing will be necessary given that the specific hypotheses do not center on predicting behaviour per se, but rather the interplay of intuition and reason in the production of behaviour. For example, if reasoning is inherently guided by underlying regulatory systems—as the ISM claims—there should be a number of ways of showing that reasoning functions as a tool, rather than an arbiter. For example, if reasoning is primarily a tool to manage one's reputation, then dual-task methodologies that are used to occupy reasoning and working memory may decrease the biases in self-reports regarding sport (e.g., intention to train, attribution bias). The ISM predicts that occupying reasoning and working memory will actually improve the accuracy of self-report, while rationalist models predict the opposite.

Biological Factors

Biological influences on motivation are woefully understudied, perhaps because the field of sport psychology is only concerned with modifiable aspects of behaviour However, studying biological factors may shed light on more modifiable factors. Further, to gather rigorous evidence of modifiable aspects of sport motivation requires ruling out

alternative explanations, many of which may be biological in nature. One promising biological factor that impacts sport motivation is testosterone (Eisenegger, Haushofer, & Fehr, 2011). First, testosterone is a hormone that is associated with the development of athletic prowess and competitiveness (Mazur & Booth, 1998) and is associated with childhood play and activity patterns (Berenbaum & Beltz, 2011), which in turn are associated with sport participation in later years (Cardoso, 2009; Giuliano, Popp, & Knight, 2000). Second, an inverse relationship has been found between levels of pre-natal testosterone and the ratio between 2D and 4D digits (respectively the index-finger and ring-finger; Lutchmaya, Baron-Cohen, Raggatt, Knickmeyer, & Manning, 2004; Manning, Scutt, Wilson, & Lewis-Jones, 1998). A relatively low 2D:4D ratio has been found to predict self-selection into physical education programs and student grades in physical activity classes (Tlauka, Williams, & Williamson, 2008) and better performance across a variety of amateur sports in both males (Manning & Taylor, 2001) and females (Paul, Kato, Hunkin, Vivekanandan, & Spector, 2006). It has also differentiated varsity athletes from their student peers (Giffin, Kennedy, Jones, & Barber, 2012) and is correlated with higher frequency of training for cross-country races (Manning, Morris, & Caswell, 2007). Finally, females with congenital adrenal hyperplasia—a condition that involves increased levels of pre-natal testosterone exposure—tend to report greater interest in more male-typical sports (Berenbaum, 1999; Frisen et al., 2009).

Conclusion

The ISM proposes novels ways in which motivation for sport is produced and regulated. The ISM argues that the mind is comprised of a number of goal-oriented regulatory systems that produce intuitions. Though these intuitions often directly guide

behaviour and are akin to motivations, but during periods of goal-conflict (conflicting intuitions) reasoning is engaged and used by regulatory systems as a tool for adaptive goal-conflict resolution. On this view, intuitions are the carpenters of the mind—they build motivation and behaviour. Reasoning is like a carpenter's tool—though sharpening the tool can impact what is built, if you want to build a new product you need to change the carpenter, not the tool.

In light of the ISM, there is a need to map the different regulatory systems that may produce motivation for sport, and how reasoning is used by these systems to achieve their goals of regulating specific social resources. I anticipate that the ISM will facilitate a re-interpretation of existing findings and foster new research, including tests of competing predictions from different models of sport motivation.

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Bridge Section: From a Theoretical Proposal to Studying Pride and Shame

The ISM highlighted several assumptions regarding the nature of sport motivation that contrast with those from prevailing theories. Specifically, this intuitionist model centered the role of intuitions and the regulatory systems that produce them. After highlighting the centrality of intuitions and regulatory systems, this theoretical proposal actually identified one system that should be important for the production of sport motivation. The ISM argues that most sport motivation mainly takes the form of status striving, and that the self-conscious emotions of pride and shame stem from a regulatory system that evolved to maximize, maintain, and signal one's status. Given this hypothesis, that pride and shame should be related to sport motivation, and thus youth sport attrition, it follows that the first preliminary tests of the ISM should be to examine if, in fact, pride and shame predict youths' intentions to return to sport.

The following section, chapter 4, describes a study in which this prediction, that pride and shame should predict youths' intentions to return to sport, was tested empirically. Pride and shame are deeply and densely intertwined in sporting contexts. However, most studies have focused on the self-conscious emotions of pride and shame as by-products of experiences, rather than drivers of motivation and behaviour. This chapter compared the capacity of pride and shame to predict intentions to return, and compared that capacity against the three components of basic needs theory: perceived competence, autonomy, and relatedness. Recall that these three components emerged as the most commonly tested and strongly supported within the systematic review on youth sport attrition.

Chapter 4 Pride Predicts Intentions to Return to Sport

Pride Better Predicts Intentions to Return to Youth Sport Than do Basic Needs

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Abstract

Objectives: This study tested two central predictions that follow from the Intuitionist Model of Sport Motivation (ISM). First, that feelings of pride and shame in sport predict intentions to return to youth sport. Second, that pride and shame continue to predict intentions to return when controlling for the perceived satisfaction of one's basic needs.

Design: Longitudinal cross-sectional design.

Methods: Youth team sport athletes completed a digital survey twice over the course of one athletic season, once during the beginning of the season (n = 226), and once near the end (n = 176). The survey included measures of pride, shame, intentions to return, and perceived satisfaction for needs of competence, autonomy and relatedness.

Results: Time co-varying analyses were conducted using hierarchical linear modelling. Results demonstrated that pride, but not shame, predicted intention to return, and together explained nearly half of the variation in intentions to return (R^2adj = .46). Although competence (ß = .30, p < .05) and relatedness (ß = .17, p < .05) also predicted intention to return, the addition of pride (ß = .34, p = < .01) and shame (ß = -.09, p > .05) to this model rendered competence (ß = .13, p > .05), relatedness (ß = .01, p > .05) insignificant. The addition of basic needs did not significantly improve model fit relative to the model containing only pride and shame, χ^2 (3) = 5.69, p > .05.

Conclusions: This study offers the first empirical support for the ISM, which maintains that intuitions are a central driver of sport behaviour. Future research should examine the relationships between testosterone, feelings of pride, and sport motivation. Further, the use of experimental designs will be necessary to test the proposed casual role of pride in youth sport motivation and behaviour.

Millions of youth across the world choose to discontinue participation in organized sport. Given that youth sport participation is a public good that offers physical and psychological benefits (see Fraser-Thomas, Côté, & Deakin, 2005; Holt, 2005), understanding the causes of why youth dropout will facilitate the creation of better sport experiences, and perhaps sustained sport participation (for a review see Gould, 2007). However, the study of youth sport motivation—and specifically the study of youth sport dropout—has been guided by models that largely concern higher-level cognitive constructs, such as beliefs, expectations, and perceptions (for a discussion see Chapters 2, 3; also see see Balish et al., in prep). According to these prevailing models, which hereafter are described as *rationalist models*, higher-level constructs are central to sport motivation because they inform a rational decision making process that helps to identify the behavior that will best satisfy one's preferences, after which motivation is produced. In other words, prevailing models assume that conscious reasoning plays a central role in the production of motivation for sport.

However, in contrast to these prevailing rationalist models, recent proposals (see Chapter 3; Balish et al., in prep) have argued for the promise of *intuitionist models* in which emotions—and the underlying computational systems that produce them—play a more central role in the production of motivation for sport. In particular, Balish and colleagues (in prep) have recently highlighted converging evidence suggesting that pride and shame are, in fact, functional, and should be deeply and densely intertwined with the production of sport motivation. In the following section pride and shame are introduced and defined. A functionalist approach is used explain why pride and shame evolved to

regulate motivation, and why these systems could be the main drivers of youth sport attrition.

A Functional Approach to Pride and Shame

Although all emotions are self-relevant at some level, pride and shame are categorized as self-conscious emotions—a unique sub-set of emotions that concern one's self or actions. Critically, self-conscious emotions involve self-relevant thoughts, feelings, intentions, and behaviours (Fisher & Tangney, 1995; Tracy, & Robins, 2004) and thus require a somewhat complex computational architecture that can occur consciously or unconsciously. Given this complexity and the need for self-awareness, pride and shame often develop later in childhood than more basic emotions (Belsky, Domitrovich, & Crnic, 1997; Lewis, Alessandri, & Sullivan, 1992; Stipek, 1998). Although pride and shame can be experienced in isolation, they are nonetheless social emotions given that they concern one's social value, or socially valued actions. Accordingly, pride is commonly defined as an emotion "generated by appraisals that is responsible for a socially valued outcome, or for being a socially valued person" (Mascolo & Fisher, 1995, p. 66). Shame is similarly defined as "acute arousal or fear of being exposed, scrutinized, and judged negatively by others" (Fisher & Tangney, 1995; Gilbert & Trower, 1990).

Unlike more "basic" emotions, pride and shame are not reliably linked to any universal facial expressions, yet both are associated with non-verbal expressions. For example, when experiencing shame, one's head and shoulders are lowered, arms are dropped to one's sides, and gaze points downward (Tracy & Matsumoto, 2008). When experiencing pride, one's posture is expanded with the head slightly tilted back, arms are

either raised overhead with fists clenched or are on one's hips with elbows expanded away from the body (Tracy & Matsumoto, 2008). The fact that these non-verbal expressions occur across cultures, and also are universally recognized, provides some of the strongest evidence that these emotions are functional adaptations (Tracy & Matsumoto, 2008; for a discussion of the evidence for universality see Norenzayan & Heine, 2005).

To take a functional approach to studying emotion is to investigate and test hypotheses of adaptative functions against plausible non-functional alternatives. In other words, a functionalist approach involves testing whether self-conscious emotions such as pride and shame are adaptations, or by-products, of human nature. Regarding pride, functionalist theories posit that pride is a conscious signature of an underlying system that helps to maximize, maintain and signal social status (which confers a number of reproductive benefits: see Von Rueden, Gurven, & Kaplan, 2010). For example, the nonverbal expression that characterizes pride is exhibited in a number of achievement-related contexts that promote social rank; by young children who win aggressive contests (Strayer & Strayer, 1976) or perform tasks successfully (Belsky, Domitrovich, & Crnic, 1997), by students who perform well on exams (Weisfeld & Beresford, 1982), and—importantly—by both sighted and congenitally blind athletes who could not have learned the expressions from visual observation (Tracy & Matsumoto, 2008). More direct evidence comes from studies that demonstrate a reliable tendency to perceive—implicitly and explicitly—pride displays as signals of high-status (Shariff & Tracy, 2009). For example, Shariff, Tracy, and Markusoff (2012) demonstrated that observers make automatic (implicit) high-status inferences about agents displaying pride, even when the

agents were paired with incongruent cues regarding their status. These studies have been replicated with North American university students, as well as within a highly isolated and traditional small-scale society on a remote island in Fiji.

Regarding shame, functionalist theories posit that shame is the conscious signature of a system that regulates social devaluation. As Sznycer et al., (2016) highlight, shame evolved to defend against social devaluation via three mechanisms: Shame (1) deters individuals from making choices where the likely costs of devaluation outweigh benefits, (2) limits adverse information about one's self from reaching others, and (3) minimizes adverse outcomes of devaluation. In a series of studies Sznycer et al., (2016) demonstrated that individual's shame closely tracks the propensity for social devaluation within one's peer group, and that this relationship occurs in diverse cultures including the United States, Israel, and India. Further, these researchers also revealed that similar emotions, such as sadness and anger, do not track devaluation as does shame. Together, emerging evidence suggests that both pride and shame play a functional role in social contexts. Pride promotes status striving while shame defends against devaluation. Given the social and competitive nature of sport, pride and shame may have important implications for sport motivation.

Pride, Shame, and Sport

Sport, by definition, is inherently a social competition where one or more people are acknowledged as winners of a physically competitive game (Deaner et al., 2012). By acknowledging winners and losers, sport effectively signals participants' sporting ability, and can do so in a zero-sum manner. If pride and shame are, in fact, psychological adaptations that adaptively regulate status and social devaluation, and if sport

participation signals sporting ability, which is associated with status and social devaluation, then one should expect pride and shame to be deeply and densely intertwined with motivation for sport. Specifically, one would expect that experiencing feelings of pride would predict continued participation where the opposite should be true for shame.

Findings from a number of recent studies suggests sport contexts are linked to both pride and social status. For example, teammates' rankings of their peers' status accurately align with those peers' self-reported pride dispositions (Cheng, et al., 2010) and peer-rated talent (Vierimaa & Côté, 2016). Further, people accurately predict the status of athletes based on their behavioral pride expressions (Martens, Tracy, & Shariff, 2012; Shariff & Tracy, 2009; Furley, Moll, & Memmert, 2015). Evidence also suggests pride plays a functional role in motivating sport behaviour—just as would be predicted if pride was a conscious signature of a regulatory system that strategically regulates status. Weidman, Tracy and Elliot (2015) longitudinally tracked competitive long-distance runners, and found that while those who performed well felt greater pride, those who felt low pride actually changed their behavior (i.e., trained more) and improved their performance in later races. Interestingly, the motivational effect did not occur for self-efficacy—those who reported low self-efficacy did not change their behavior and improve performance. In a retrospective study, people who recounted past prideful experiences report that the experience increased sport motivation and behavior (Castonguay, Gilchrist, Mack, & Sabiston, 2013). This compliments research in which those who report greater levels of pride also report greater levels of moderate/vigorous physical activity (Mack, Kouali, Gilchrist, & Sabiston, 2015).

Although few studies have examined the influence of shame on sport motivation and behavior, studies of non-competitive physical activities suggest shame is associated with deceased motivation and behaviour. Using an experimental shame induction technique (i.e., ostracism in a digital ball-tossing game), children who were ostracised in the shame condition were substantially less active in a subsequent recreational setting than were control groups (Barkley, Salvy, & Roemmich, 2012). Similarly, cross-sectional studies of body-related shame (as opposed to performance-related shame) has been linked to decreased physical activity (Castonguay, Pila, Wrosch, & Sabiston, 2014; Sabiston, Brunet, Kowalski, Wilson, Mack, & Crocker, 2010).

Together, these findings suggest that both pride and shame should play important roles in sport motivation and could help explain youth sport dropout. However, few, if any studies have examined how pride and shame may predict motivation and dropout from youth sport. One exception is a recent study by Pila and Sabiston (2015), which demonstrated that appearance-related shame predicts decreased sport commitment. However, no study has yet to focus on feelings of pride and shame, in general, and how they are related to sport attrition. The primary purpose of the present study was to examine how pride and shame predict intentions to return to sport at the end of that season. The secondary purpose was to examine if pride and shame predicts intentions to return when controlling for basic needs theory (i.e., competence, autonomy, and relatedness).

Methods

Participants

Participants were recruited from basketball, hockey, and volleyball clubs organizations throughout Halifax Nova Scotia, Canada. Participants were eligible to participate if they (a) were currently participating on an organized team sport in which they practice or compete at least twice per week, (b) are between the ages of 12 and 17, (c) provided both personal and parental consent, and (d) are able to read and write in English. Participants were included if they completed at least one of the two surveys, either during the beginning or end of the season.

Procedure

After receiving ethical approval from Dalhousie University, the research assistant approached youth sport organizations across Halifax Regional Municipality. Once these youth sport organizations agreed to support the research project, members were reached through one of two strategies. One strategy involved the youth sport club emailing all their adult members, wherein they highlighted the research project and asked parents to consider providing consent for their child by clicking on a hyperlink in the email, which directed them to a consent form. The second strategy involved the research assistant receiving permission to contact coaches of teams within the specified age range, to arrange to meet the coach and team at a following practice. At that point, the coaches were given a digital link to the consent form, which they sent to parents. Coaches were also offered paper-based consent forms to distribute to their athletes, but all preferred the digital link to the consent form. Once parents consented their child and provided their child's email address and name, the first author sent an email to the potential participant that included an assent form and the actual survey. This email was sent during the first half of the participant's athletic season and constituted the first survey time point. During

the second half of the athletic season, participants were sent the same survey with the exception of questions that concerned demographics, which were excluded (i.e., time 2).

Measures

Pride. Pride was measured using the Authentic Pride scale (Tracy, Cheng, Robins, & Trzesniewski, 2009). The Authentic Pride scale was developed from a series of studies that examined (a) subjective feelings during a pride experience, or (b) chronic distortional tendencies to experience pride. The scale consists of 7 items, including "accomplished", "like I am achieving," "confident," "fulfilled," "productive," "like I have self-worth," and "successful"). The scale is an adjective based scale where participants report how they perceive they are associated with each adjective using a 5-point scale (i.e., 1 = "not at all", 5 = "extremely").

Shame. The Others as Shamer Scale (Allan, Gilbert, & Goss, 1994; Goss, Gilbert, & Allan,1994) was used to measure participants' shame in sport. This measures how participants perceive what others think of them. The Others as Shamer Scale is often used to study shame in small group settings, and thus was deemed appropriate for the social nature of sport. The scale consists of 18 items (e.g., "Teammates see me as not measuring up to them", "Teammates and coaches see me as small and insignificant") that are rated on a five-point scale (0 = "never", 4 = "almost always"). Participants were asked to indicate the frequency with which "you find yourself feeling or experiencing what is described in the statement".

Basic needs. To measure participants perceived satisfaction of needs for competence, autonomy, and relatedness in sport, I adapted 15 items that were used by Quested et al. (2013) to study the relationship between basic needs and youth sport

attrition. These 15 items are divided between the three above mentioned constructs: (1) autonomy support (e.g., “I decided which activities I practiced”), (2) competence satisfaction (e.g., “I thought I was quite good at this sport”), and (3) relatedness satisfaction (e.g., “I felt people supported me”). The response format employed a 5-point scale (1 = “strongly disagree”, 5 = “strongly agree”).

Intention to return. To measure athletes’ intentions to return, four items were adapted from Quested et al. (2013). Two items concerned intentions to continue or discontinue from one’s sport entirely (e.g., I intend to drop out of this sport at the end of this season) while the other two concerned intentions to play for one’s team next season (e.g., I am thinking of quitting my team). The response format employed a 5-point scale (1 = “strongly agree”, 5 = “strongly disagree”).

Analytical Strategy

Given the nested nature of the data (i.e., repeated assessments nested within the individual), hierarchical linear modeling (HLM) was used. This approach is particularly useful with unbalanced designs (i.e., due to missing data created by attrition) because it includes all participants that have available data points along the trajectory using maximum likelihood estimation (Allison, 2002; Raudenbush &Bryk, 2002). Four regressions were conducted. The first model entered a random intercept (i.e., to allow the baseline intention score to vary across participants) and a fixed linear trend (dummy coded 0 = baseline, 1 = end of season) at Level-1 to examine the potential change in intention. Second, given that the three basic needs (i.e., autonomy, competence, relatedness) scales were completed at both time points, they were entered into the Level-1 model as time-varying covariates to determine whether they predicted intention to return

to sport. The deviance statistic (i.e., a measure of model fit) of model 1 was compared against the deviance statistic of model 2 using the likelihood ratio test. A significant decrease in the deviance statistic is an indication of improved model fit (Raudenbush &Bryk, 2002). The third regression entered a linear trend with pride and shame treated as time varying covariates to determine their potential association with intention to return. Again, the likelihood ratio test was used to compare model 3 vs. model 1. Finally, the fourth regression entered a linear trend and the basic needs scales, pride, and shame as time varying covariates. The likelihood ratio test compared model 4 vs. model 2 to determine if pride and shame improved the model fit over and the basic needs model.

Prior to conducting the HLM analyses, data cleaning was performed wherein data was visually inspected, and skewness and kurtosis values for each variable were calculated. Outliers (i.e., with z-scores > 3.29) were removed from variables with either a skewness or kurtosis > 2.0.

Results

Overall, 216 young athletes responded to the digital survey link and agreed to complete the survey. However, while 171 completed the entire survey, 24 partially completed the survey, and 11 agreed, but did not complete the survey (i.e., opened the survey, but did not answer questions). Further, 10 duplicates were deleted. Duplicates with incomplete responses, and if both reposes were complete, second (i.e., older) duplicate was deleted. This resulted in a final of sample size of 195 for time one (i.e., beginning of season). Regarding time two (i.e., end of season), 173 young athletes responded to the digital survey link and agreed to complete the survey. However, while 126 completed the entire survey, 21 partially completed the survey. Further, 7 responses

were duplicates while 19 agreed but did not complete the survey. This resulted in a final of sample size of 147 for time one (i.e., end of season). On average, participants were primarily female (51.8%), adolescents (M = 13.87, SD = 1.74), Caucasian (90.8%), and reported having several years of experience participating in amateur organized sport (M = 5.48, SD = 2.77).

Preliminary analyses showed that skewness was satisfactory (< 2.0), however, the intentions to return, others as shame and need for relatedness scales were kurtotic (> 2.0). As each variable had < 3 cases with outliers, they were removed and resulted in satisfactory kurtosis values (< 2.0). As displayed in Table 3, intentions to return to sport were relatively high, as was pride, competence, relatedness, and autonomy. Feelings of shame were low. Most variables were significantly correlated, especially pride and competence. In terms of the HLM analyses, results from the first analysis (i.e., Model one in Table 4) showed that intention to return decreased across the season ($\beta = -.11$, $p < .05$) and this change explained only a small portion of variance ($R^2 = .02$). Model two showed that competence ($\beta = .30$, $p < .05$) and relatedness ($\beta = .17$, $p < .05$) predicted intentions to return, but autonomy ($\beta = .02$, $p > .05$) did not ($R^2 = .43$). This model significantly improved model fit relative to model one $\chi^2 (3) = 345.48$, $p < .01$. For model three, pride was a significant predictor of intentions to return ($\beta = .41$, $p < .05$), whereas shame ($\beta = -.14$, $p > .05$) was not ($R^2 = .46$). This model (#3) also significantly improved model fit relative to model one $\chi^2 (2) = 128.10$, $p < .01$. Finally, results from model 4 demonstrated that pride was a significant predictor of intentions to return ($\beta = .34$, $p < .05$), whereas shame ($\beta = -.09$, $p > .05$), autonomy ($\beta = .03$, $p > .05$), competence ($\beta = .13$, $p > .05$), and relatedness ($\beta = .01$, $p > .05$) did not. Further, this final model (#4)

significantly improved model fit relative to model two (basic needs only) χ^2 (2) = 44.86, $p < .01$, but did not improve model fit compared to model three (pride and shame only) χ^2 (3) = 5.69, $p > .05$.

Discussion

Although there are a number of factors that could help explain intentions to return to sport, the main finding from this study suggests that pride is one major motivating factor. Similarly, this study also demonstrated that feelings of shame, and perceived satisfaction of basic needs (i.e., autonomy, competence, relatedness), may not independently contribute to our understanding of intentions to return to sport when accounting for the role of pride. Indeed, the established relationships between basic needs and intentions to return was rendered insignificant when pride and shame were added to the model. More broadly, these findings highlight the potential role of intuitions, particularly the self-conscious emotion of pride, as primary drivers of intention to return to sport. These findings also contrast with the basic assumptions of rationalist models of motivation, and provide the first empirical support for the ISM.

The Functional Role of Pride and Shame

Rather than being viewed as an epiphenomenon of participating in sport, there is converging evidence supporting a functionalist view of pride (Tracy et al., 2010). Recall that, on

Table 3

Alpha values, means, standard deviations, and zero-order correlations for pride, shame, and basic needs.

Variables	M	SD	α	1	2	3	4	5	6	7	8	9	10	11	12
(1) Intention to Return (T1)	4.56	0.46	.87	--											
(2) Intention to Return (T2)	4.39	0.65	.76	.65**	--										
(3) Pride (T1)	4.12	0.70	.91	.52**	.38**	--									
(4) Pride (T2)	4.02	0.75	.90	.51**	.58**	.65**	--								
(5) Shame (T1)	1.40	0.54	.92	-.30**	-.34**	-.49**	-.43**	--							
(6) Shame (T2)	1.49	0.59	.92	-.34**	-.47**	-.29**	-.51**	.65**	--						
(7) Competence (T1)	4.21	0.63	.92	.42**	.33**	.68**	.55**	-.54**	-.50**	--					
(8) Competence (T2)	4.17	0.63	.90	.41**	.54**	.49**	.66**	-.43**	-.58**	.67**	--				
(9) Autonomy (T1)	3.84	0.65	.73	.26**	.14	.38**	.23**	-.34**	-.30**	.57**	.28**	--			
(10) Autonomy (T2)	3.78	0.62	.71	.23**	.39**	.13	.40**	-.12	-.38**	.29**	.55**	.46**	--		
(11) Relatedness (T1)	4.09	0.68	.82	.42**	.49**	.66**	.54**	-.56**	-.37**	.76**	.56**	.58**	.33**	--	
(12) Relatedness (T2)	4.09	0.69	.86	.38**	.53**	.38**	.59**	-.28**	-.58**	.41**	.67**	.22**	.56**	.51**	--

Note: *p < .05, **p < .01, (all one-tailed).

Table 4

Hierarchal linear modelling analysis examining the basic needs to predict on intentions to return, when controlling for pride and shame.

		Model 1			Model 2			Model 3			Model 4		
Variables	Parameter	Beta	*SE*	*t* ratio	Beta	*SE*	*t* ratio	Beta	*SE*	*t* ratio	Beta	*SE*	*t* ratio
Intercept	β_{00}	4.53	.03	132.16**	4.54	0.03	144.33	4.53		.03	4.53	.03	147.18**
Linear trend	β_{10}	-.12		-2.65**	-.10	0.05	-2.16				-0.07	.04	-1.69
Autonomy	β_{20}				0.02	0.04	0.47				0.02	0.04	0.57
Competence	β_{30}				0.26	0.06	4.13**				0.12	0.06	1.82
Relatedness	β_{40}				0.15	.06	2.33**				0.01	0.06	0.11
Pride	β_{50}							-0.06	-.06	.04	0.26	.05	5.12**
Shame	β_{60}							0.31	.41	.05**	-0.09	0.07	-1.25
Model test (2 vs 1)	--				χ^2 (3) = 345.48**								
Model test (3 vs 1)	--							χ^2 (2) = 128.1**					
Model test (4 vs 2)											χ^2 (2) = 44.86**		
Model test (4 vs 3)											χ^2 (3) = 5.69		

Note. * p < .05, ** p < 0.1, beta = unstandardized beta. β = standardized beta. SE = standard error. χ^2 = chi squared statistic.

Final hierarchal model (Model 3)

Intention to Return = β_{00} + β_{10}[Linear trend] + β_{20}[Autonomy] + β_{30}[Competence] + β_{40}[Relatedness] + β_{50}[Pride] + β_{60} [Shame] + e.

this functionalist view, pride is a conscious signature of an evolved system that regulates status striving motivation, such that individuals maximize, maintain, and signal their status (Tracy et al., 2010). Regarding the main finding from this study, feelings of pride are viewed as evolved signals that an individual is acquiring status within their sporting context. This indicator, that oneself is acquiring status in sport, in turn, feeds back into the system that regulates status striving motivation such that individuals continue to be motivated to participate in sport.

Although the main finding from this study is perhaps the first to demonstrate that the experience of pride in sport—in general—contributes to intentions to return, previous research has demonstrated that similar self-conscious emotions predict important outcomes in female youth sport. Pila and Sabiston (2015) found that appearance-related shame across one year of sport participation predicts not only sport commitment, but also sport enjoyment and competitive sport anxiety. Similarly, findings from the present study also align with research on self-conscious emotions in physical activity settings, where higher levels of pride have been associated with greater moderate/vigorous forms of physical activity (e.g., Mack, et al., 2015).

Although this study statistically differentiated pride from the perceived satisfaction of competence—which itself has been previously shown to be a strong predictor of intentions to return to sport (Quested et al., 2013)—there remains a significant amount of overlap between the operational definitions of these and similar constructs (i.e., self-esteem, self-efficacy). Pride is widely considered an emotional response to a success or achievement, while the basic need of competence is considered an independent goal state that individuals consciously strive to satisfy. However, while pride and competence are similar and can both occur in everyday life, they are

theoretically and phenomenologically distinct. For example, an elite level athlete who competes with recreational level athletes may feel competent in their competition, but not overly proud of their ability, and thus discontinue competing. The absence of pride in this situation may reflect the fact that an elite athlete beating a recreational athlete in not a socially valued behavior. As this example highlights, it is the emotional component of pride that should drive motivation (Williams & DeSteno, 2008). Individuals can consciously consider a need to feel competent, but pride should arise, and motivation be strongest, when the task is socially valued. One of the main tenets of the ISM, is that individuals do not simply seek out competence as an end in itself, but rather the system that motivates competence seeking behaviour motivates individuals towards contexts that are socially valued, such that these individuals—knowingly or unknowingly—acquire status.

With the advent of the ISM, and its claim that intuitions, not rational constructs, are the main drivers of sport motivation, it will be necessary to carefully consider and explicitly state the boundaries between these constructs, and their seemingly overlapping operational definitions. Indeed, this study statistically demonstrated significant overlap between self-conscious emotions and basic needs. Nonetheless, these constructs may be interrelated at different analytic levels. At the behavioural level, the ISM argues that individuals should strive for status, not necessarily competence (see Chapter 3; Balish et al., in prep). However, the purported regulatory system that strategically guides motivation towards worthwhile opportunities for status should logically require a measure of one's competence relevant to others, otherwise the system will not identify worthwhile opportunities. This means that on some level, which could be consciously accessible or not, individuals should have a measure of their relative competence (self-efficacy?) on a

suite of particular tasks. It is possible, perhaps even plausible, that measures of feelings of competence or self-efficacy are actually measuring the (consciously accessible) computational components that the status system uses to strategically guide motivation.

What do Basic Needs Measure?

In the present study I measured participants' perceived satisfaction of basic needs using nearly identical scales as those used by Quested and colleagues (2013). These researchers, among many others (see Chapter 2; Balish et al., 2013), have demonstrated that the need for autonomy, competence and relatedness are linked to intentions to return, and actual sport attrition. However, findings from this study demonstrated that these associations are rendered insignificant when pride and shame and entered into the predictive model. This suggests at least some statistically overlap between these variables. The zero-order correlations support this claim, as basic needs and self-conscious emotions were highly correlated. In the proceeding section, these findings are discussed in light of the ISM, and also how these findings contrast with rationalist models of sport motivation.

Prevailing rationalist theories have often considered emotion as an epiphenomenal by product of sport participation (e.g., Ajzen, 2011; Bandura, 1989, 2001). In other words, through simply playing sport individuals will experience pride and shame, but these emotions do not, themselves, have any causal effects. Their influence on the world supposedly stops at the level of individuals' subjective experience. However, if this was correct, then the addition of basic needs should have unique portions of variance beyond the contributions of pride and shame. In contrast to the view of self-conscious emotions as epiphenomena, it is possible that pride and shame are simply more proximal to intentions to return, or perhaps that basic needs are simply measuring, in part, aspects of

pride and shame. The latter interpretation aligns more closely with the ISM, which argues that intuitions such as pride and shame actually guide conscious reasoning. On this view, if someone is asked to report their perceptions of having satisfied their need for competence in sport, they may experience subtle, quasi-conscious feelings of pride and shame, and these feelings may lead them to report that they did, in fact, satisfy their need for competence. Nonetheless, this study did not establish that pride and shame are feeding into measures of basic needs. Overall the results of this study raises the question of what basic needs are actually measuring, or how proximal they may be to intentions to return to sport.

Future Research

Future research should examine the functional role of pride using more sophisticated longitudinal designs. Whereas high levels of pride within a context should lead to persistence in that context, low levels of pride should change actual behaviour such that individuals either dropout of sport (or intend to, as this study demonstrated) or find ways to improve in sport and acquire status. For an example of the latter, consider that Weidman and colleagues (2016) recently demonstrated that competitive runners who experienced lower levels of pride after specific races were more likely to train harder to improve their performance, while those who experienced higher self-efficacy, simply maintained their training levels. If pride and shame are, in fact, conscious signatures of functional mechanisms, then there should be ways to manipulate them to facilitate behaviour change.

Another profitable avenue of future research involves testing the linkages between testosterone exposure and sport motivation and behaviour. Converging evidence suggests that prenatal testosterone exposure is associated with the development of a number of

secondary sexual characteristics, including increased athleticism, aggression, and even preferences for sport (for a review see Berenbaum & Beltz, 2011). Furthermore, testosterone has been linked to status striving (Eisenegger, Haushofer, & Fehr, 2011), which in turn has been linked to feelings of pride (Martens et al., 2012). If pride is, in fact, a primary determinant of important sporting outcomes, then prenatal testosterone exposure should also help explain, in part, sport motivation.

This study was guided by the ISM, which offers predictions that contrast with rationalist models. To test these contrasting, and in many ways nuanced, predictions, experimental designs should be employed. For example, whereas intuitionist models assume that intuitions drive reasoning, motivation and behaviour, rationalist models assume that a rational decision making process guide intentions and behaviour. One way to test these contrasting models would be to using dual-task methodologies to upregulate or downregulate conscious reasoning, and examine its affects on intentions and behaviour. For example, the ISM predicts that individuals who are primed to reason more thoroughly about their intentions to engage in sport will actually have larger discrepancies between their actual intentions and behaviour.

Limitations

This study has several limitations. The first is that the authentic pride scale to measure general feelings of pride in sport was used. Although this scale has been linked to self-reported physical activity behaviour (e.g., Mack et al., 2013), the relationship between pride and intentions to return may change across measures. Further, this study did not specify the type of pride or type of shame that participants should consider when they answer the scales. For example, Pila and Sabiston (2015) example appearance-related pride and shame, finding that only appearance related shame impacted young

females sport commitment. Future studies that specifically focus on performance-related or appearance-related pride and shame may find different associations with intentions to return, and these may vary by gender as well.

It is an open question how well these findings will generalize across different societies, or even different sports. However, the ISM claims that the regulatory systems that produce feelings of pride and shame are parts of human nature (i.e., reliably developing psychological systems; Brown, 1991) and thus should be apparent across all human societies. Given this evolutionary informed approach, pride and shame should be important determinants of sport outcomes across all societies, and even sports. Nonetheless, the magnitude of these relationships should vary according to how the culture values the specific forms of sport in question. For example, the sample in the present study was composed of team sport athletes from basketball, ice hockey, and volleyball. Given the social nature of pride and shame, the relationships found in this study may decrease in individual sports, where social processes are less apparent. Similarly, given that pride and shame are dependent on qualities that are socially valued, and that what is socially valued varies across societies, the results should vary, albeit slightly, across societies.

Conclusion

In closing, this study provides some of the first empirical support for the ISM, and highlights feelings of pride as an important, and perhaps, central factor for understanding young athletes' intentions to return to sport. Indeed, this study demonstrated that perceived satisfaction of basic needs (i.e., autonomy, competence, relatedness) did not independently contribute to the hierarchical model above and beyond the contributions of pride. This finding draws into question the nature of the basic needs, and what the

corresponding scales may be measuring. Future research that aims to test the role of pride should test its previously established relationship with prenatal testosterone exposure, and how this exposure may be related to sport motivation. Another avenue relationship of future research should employ experimental designs to test the causal claim that feelings of pride, but not self-efficacy or perceptions of competence, is a main driver of reasoning about sport, and sport behaviour.

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Bridge Section: Pride and Shame to Digit Ratio

This section, chapter 4, concerned a preliminary test of the ISM; that pride and shame should predict youths' intention to return to sport. This study found that, in fact, pride, but not shame, best predicts intentions to return to sport. This finding provides some of the first evidence in support of the ISM, and the claim that sport motivation may be conceptualized as status striving. Overall, the finding that pride predicts intentions to return suggests that biological factors that affect pride and status striving may impact sport motivation. For example, testosterone has been associated with status striving in previous research in neighbouring fields.

Given that pride predicts intentions to return to sport, and that there is a wealth of literature regarding how testosterone is linked to pride and status striving, the ISM offers another, deeper hypothesis: those who were exposed to higher levels of prenatal testosterone should be more motivated to play sport, all else equal. In particular, testosterone is associated with risk taking and increased confidence, thus, it can also be hypothesized that feelings of self-assurance should mediate the relationship between testosterone and sport motivation. Accordingly, the aim of the study in the following chapter (5), was to test if a biological marker of prenatal testosterone (the ratio of the length of one's 4^{th} digit to their 2^{nd} digit) actually predicts different forms of sport motivation, and if feelings of self-assurance mediates these relationships.

Chapter 5 Digit-Ratio (2D:4D) Predicts Sport Motivation

Digit-Ratio (2D:4D) Predicts Youth Sport Motivation through Feelings of Self-Assurance

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Abstract

Objectives: This aim of this study was to test if a biological marker of prenatal testosterone exposure—the ratio of the length of the second digit to the fourth digit (2D:4D)—predicts sport motivation, and if self-assurance mediates this relationship.

Design: Cross-sectional design.

Methods: Youth athletes (n = 45) completed a survey that measured demographics, feelings of self-assurance, and intrinsic, integrated, and amotivational forms of sport motivation. The ratio of the length of the second digit and fourth digits on both the left and right hand were measured with digital calipers.

Results: Digit ratio (2D:4D) was directly related to intrinsic and amotivation, but not integrated motivation. Nonetheless, bootstrapping mediation analyses demonstrated that, by acting indirectly through feelings of self-assurance, 2D:4D predicted higher levels of intrinsic and integrated forms of sport motivation, and lower levels of amotivation, while controlling for gender.

Conclusions: Prenatal testosterone exposure, as measured by 2D:4D, appears to influence important forms of sport motivation by acting through feelings of self-assurance. These findings align with the intuitionist model of sport motivation, and highlight a potential mechanism through which biology impacts the psychology of sport motivation. Future research may benefit from further investigating how testosterone impacts the nature of status striving in sport, and specific pathways through which these effects occur.

Testosterone is a steroid hormone secreted by testes in men and—to a lesser extent—ovaries in women, and has been implicated in the development of many secondary sexual characteristics (for a review see Mazur & Booth, 1998). In particular, prenatal development is a critical period in which testosterone exposure contributes to a number of psychological and physiological characteristics (Berenbaum & Beltz, 2011; Honekopp, Manning, & Muller, 2006). For example, females with congenital hyperplasia—a rare medical condition that involves increased levels of prenatal testosterone—tend to report greater interest and participation in more male dominated activities, including sports (Berenbaum, 1999; Frisen et al., 2009).

While converging evidence suggests that prenatal testosterone contributes to preferences for sport, prevailing models of sport and exercise (e.g., Ajzen, 2011; Bandura, 1989, 2001; Ryan & Deci, 2000) have been met with criticism as they have been unsuccessful in explaining how biological factors influence motivation and behavior (see Chapters 1, 3-4; Balish, Eys, & Schulte-Hostedde, 2013). For example, testosterone exposure seems to have direct effects on individuals' preferences (Eisenegger, Haushofer & Fehr, 2011). More broadly, prevailing models have not facilitated novel worthwhile hypotheses (Hall, 2014; Rhodes, 2014; Sniehotta, Presseau & Araujo-Soares, 2014, 2015). Such models have been categorized as *rationalist models*, given that they assume that rational deliberation is the arbiter of sport motivation and behaviour (see chapters 1, 3 - 4; Balish, Rainham, Blanchard, 2016; also see Haidt, 2001).

In contrast to rationalist models, Balish and colleagues (2016) have proposed an intuitionist model of sport motivation (ISM), in which intuitions (e.g., emotions, gut feelings), arising from underlying regulatory systems, shape reasoning and rational deliberation, and in turn sport behaviour. Specifically, while the ISM gives primacy to

intuitions, it is the mechanisms that produce these intuitions that may explain how testosterone is linked to preferences for sport (Balish, Eys, & Schulte-Hostedde, 2013). The ISM claims that the human mind is comprised of evolved, feedback regulated mechanisms, hereafter termed *regulatory systems (*Cosmides & Tooby, 2000, 2013). Although it is well established that regulatory systems motivate the acquisition of metabolic resources, such as by producing feelings of hunger (e.g., energy), feelings of suffocation (e.g., oxygen), and feelings of thirst (e.g., fluid balance), the ISM supports the notion that regulatory systems also evolved to regulate social resources, in particular, the acquisition of social status (see Chapter 3; Balish, Rainham, & Blanchard, 2016).

If sport motivation is largely the result of status striving (see Chapter 3), and if testosterone promotes status striving (Eisenegger, Haushofer & Fehr, 2011), then it is plausible that an athlete's motivation for sport should vary as a function of their exposure to testosterone during critical periods of development.

Prenatal Testosterone Exposure and Sport

An inverse relationship has been found between levels of prenatal testosterone and the ratio between the second and fourth digits (2D:4D; Lutchmaya, Baron-Cohen, Raggatt, Knickmeyer, & Manning, 2004; Manning & Taylor, 2001; Voracek & Loibl, 2009). Accordingly, 2D:4D ratio has been used as a physiological marker for studying the effects of prenatal testosterone exposure. For example, a relatively low 2D:4D ratio has been found to predict self-selection into physical education programs and student grades in physical activity classes (Tlauka, Williams, & Williamson, 2008) and better performance across a variety of amateur sports in both males (Manning & Taylor, 2001) and females (Paul, Kato, Hunkin, Vivekanandan, & Spector, 2006). The 2D:4D ratio has also differentiated varsity athletes from their student peers (Giffin, Kennedy, Jones, &

Barber, 2012) and is correlated with higher frequency of training for cross-country races (Manning, Morris, & Caswell, 2007).

There are two pathways which may explain why prenatal testosterone (indexed by 2D:4D ratio) is associated with sport. The first is effects on physiology. High levels of prenatal testosterone are associated with the development of greater cardiovascular efficiency, more physical endurance and speed, and superior visuospatial abilities (for a review of this evidence see Manning & Taylor, 2001). These physical attributes are likely to confer success in sport and other physical activities, and result in higher sport motivation to continue this success.

The second pathway concerns effects on psychology. Testosterone is best understood as "social hormone" that regulates the search for, and maintenance of, social status (Eisenegger, Haushofer, & Fehr, 2011; Josephs, Mehta, & Carre, 2011). For example, prenatal testosterone exposure is associated with increases in dominance-oriented social behavior including aggression and competitiveness later in development (Archer, 2006; Mazur & Booth, 1998) although mainly for males (Eisenegger, et al., 2011; Josephs, Mehta, & Carre, 2011). Higher levels of prenatal testosterone are also associated with the propensity for rough-and-tumble play in young children (Collaer & Hines, 1995; Auyeung, Baron-Cohen, Ashwin, Knickmeyer, Taylor, Hackett & Hines, 2009) which is also a predictor of sports participation at later ages (Cardoso, 2009; Giuliano, Popp, & Knight, 2000). An increased propensity to strive for status through physical competition is associated with greater levels of sport motivation.

Digit Ratio, Self-Assurance and Sport Motivation.

Recall that the ISM proposes that sport motivation is largely produced by a system that evolved to maximize, maintain and signal social status (Balish et al., 2016). Given

the established links between testosterone and status striving (e.g., Eisenegger, et al., 2011), individuals with greater exposure to prenatal testosterone exposure should have developed a status system that produces stronger intuitions to acquire status than it otherwise would. If this is the case, then greater prenatal testosterone exposure be associated with increased sport motivation, and intuitions regarding status striving should mediate this relationship.

Status striving is only adaptive when one engages tasks (e.g., competitions) in which one has a high likelihood of winning. Accordingly, feeling self-assured should likely be a precursor to sport motivation. For example, if an athlete intuitively *feels* extremely self-assured (i.e., strong, confident, bold, fearless) regarding her ability relative to an opponent's, then that individual's status system should be more likely to produce motivation to engage in sport. Accordingly, feelings of self-assurance may be one such mechanism through which 2D:4D acts on sport motivation. Although self-assurance is often conceived and measured as a positive emotion, it has only been studied as an by-product, not as a driver of motivation and behaviour (e.g., Graham, Kowalski, & Crocker, 2002).

The primary aim of this study is to test if 2D:4D predicts sport motivation, and if this relationship is mediated by feelings of self-assurance. Three hypotheses were tested. First, lower 2D:4D will predict greater intrinsic sport motivation, and that feelings of self-assurance will mediate this relationship. Second, lower 2D:4D will predict greater integrated sport motivation, and that feelings of self-assurance will mediate this relationship. Third, higher 2D:4D will predict greater sport amotivation, and that feelings of self-assurance will mediate this relationship.

Methods

Participants

Participants were recruited from basketball, hockey, and volleyball clubs and organizations across Halifax Nova Scotia, Canada. Participants were eligible to participate if they (a) were currently participating on an organized team sport in which they practice or compete at least twice per week, (b) are between the ages of 12 and 17, (c) provided both personal and parental consent, and (d) are able to read and write in English.

Procedure

After receiving ethical approval from Dalhousie University, the research assistant approached youth sport organizations across Halifax Regional Municipality. Once these youth sport organizations agreed to support the research project, members were reached through one of two strategies. One strategy involved the youth sport club emailing all their adult members, wherein they highlighted the research project and asked parents to consider providing consent for their child by clicking on a hyperlink in the email, which directed them to a consent form. The second strategy involved the research assistant receiving permission to contact coaches of teams within the specified age range, to arrange to meet the coach and team at a following practice. At that point, the coaches were given a digital link to the consent form, which they sent to parents. Coaches were also offered paper-based consent forms to distribute to their athletes, but all preferred the digital link to the consent form. Once parents consented their child and provided their child's email address and name, the first author sent an email to the potential participant that included an assent form and the actual survey. This email was sent during the first half of the participant's athletic season and constituted the first survey time point. During

the second half of the athletic season, participants were sent the same survey with the exception of questions that concerned demographics, which were excluded (i.e., time 2).

Both surveys involved the same series of scales regarding motivational factors and sport participation. However, this study only concerns responses to several of the scales from the second time point (i.e., end of season; see Chapter 3 for other scales involved in this survey). While 2D:4D was measured throughout the season, the second time point for survey responses was chosen given that sport motivation at the end of one season, as opposed to earlier in the season, is most commonly measured and reported throughout the relevant literature, and is theoretically most proximal to the decision to return to sport. To measure the lengths of the second and fourth digits, the research assistant approached participants during a scheduled practice time during the season.

Measures

2D:4D ratio. Following commonly established guidelines (e.g., Caswell & Manning, 2009), participants were instructed to hold their hand supine with fingers fully extended. The length of participants second and fourth digits on each hand were measured three times from the midline of the flexion crease most proximal to the palm, and to the fingertip using digital, high precision (10^{-3}) vernier calipers. The three measures were then averaged to create a single finger length measure for both the second digit and fourth digit of each hand of each participant.

Self-assurance. The self-assurance sub-scale of the PANAS-X is designed to measure positive feelings of self-assurance, especially feelings related to confidence and risk-taking which are relevant to the competitive nature of sport (Watson & Clark, 1999). This sub-scale is adjective-based and includes six items: proud, strong, confident, bold,

daring, fearless. Participants were asked to rate their agreement of how well the adjectives described themselves using a 5-point response format (1 = "not at all", 5 = "extremely").

Sport motivation. To measure sport motivation, three scales were taken from the validated Sport Motivation Scale II: (1) the intrinsic regulation subscale, (2) the integrated regulation subscale, and (3) the amotivation subscale (SMS; Pelletier, Rocchi, Vallerand, Deci, & Ryan, 2013). Each scale is composed of three items and employed a 5-point response format (1 = "strongly agree", 5 = "strongly disagree").

Data Cleaning & Analytical Strategy

Data cleaning involved visually inspecting the data and examining skewness and kurtosis values for each variable. Those with greater than a value of 2 for either skewness or kurtosis were then transformed into standardized values, where after outliers were removed (>3.29). This process identified one outlier within amotivation. The removal of this outlier resulted in satisfactory values (< 2) for skewness and kurtosis.

Given the mediational hypotheses, that 2D:4D will predict forms of sport motivation, and that feelings of self-assurance will mediate these relationships, data analysis employed Preacher and Hayes' (2008) SPSS macro PROCESS. This macro offers a bootstrapping approach that is superior to both Baron and Kenny's (1986) mediation procedure and the normal theory approach as it provides more accurate Type 1 error rates and possess greater power (MacKinnon, Lockwood, & Williams, 2004; Preacher & Hayes, 2008). Separate mediation analyses were conducted for each of the three sport motivation scales (e.g., intrinsic, integrated, and amotivated). Direct and indirect pathways were evaluated, including the bias-corrected and accelerated confidence intervals produced via bootstrapping methods (k = 5000).

Results

The entire sample characteristics and results of other analyses are presented elsewhere (see Chapter 3). Regarding time two (i.e., end of season), 173 young athletes responded to the digital survey link and agreed to complete the survey. However, while 126 completed the entire survey, 21 partially completed the survey. Further, 26 responses were either duplicates or agreed but did not complete the survey, and thus were deleted. Finally, only 45 participants completed the 2D:4D measurement. This resulted in a final of sample size of 45 participants with full data (i.e., end of season). The sex of six out of 45 participants was imputed using their given names and names of top friends. On average these 45 participants reported an average age of 14.9 (SD:1.3) with 67.7 % being female.

Table 5 presents mean and standard deviations, alpha reliability coefficients, and correlations for all measures used in this study. All of the alpha reliability coefficients surpassed satisfactory levels (i.e., $\alpha > .70$). Bivariate correlations between 2D:4D and self-assurance was significant and occurred in the expected direction. However, while 2D:4D was correlated with intrinsic motivation, it was statistically insignificant (marginally) for integrated and amotivated forms of sport motivation. Self-assurance and all forms of sport motivation were correlated with each other. On average participants had a slightly longer fourth digit relative to their second digit, and reported being self-assure, intrinsically and integrally motivated, and low in amoitvation.

Table 5

Alpha Values, Means, Standard deviations, and Correlations for 2D:4D, self-assurance, and motivations.

Variables	M	SD	α	1	2	3	4	5
(1) 2D:4D ratio	0.98	0.03	--	--				
(2) Self-assurance	3.56	0.88	.88	-.35**	--			
(3) Intrinsic motivation	5.54	1.13	.70	-.26*	.64**	--		
(4) Integrated motivation	5.71	1.36	.86	-.22	.47**	.60**	--	
(5) Amotivation	1.62	0.95	.82	.17	-.43**	-.31*	-.31*	--

Note: *p < .05, **p < .01, (all one-tailed).

The first model tested if 2D:4D predicted intrinsic sport motivation, and if this relationship was mediated by self-assurance. The indirect effect was tested using bootstrapping procedures wherein unstandardized indirect effects were computed for each of 5,000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 95th percentiles. The bootstrapped unstandardized indirect effect did not cross zero, thus the indirect effect was statistically significant (see Figure 7, Table 6). Specifically, the indirect effect accounted for 84% of the direct effect, while both 2D:4D and self-assurance explained 43% of the variance in intrinsic motivation.

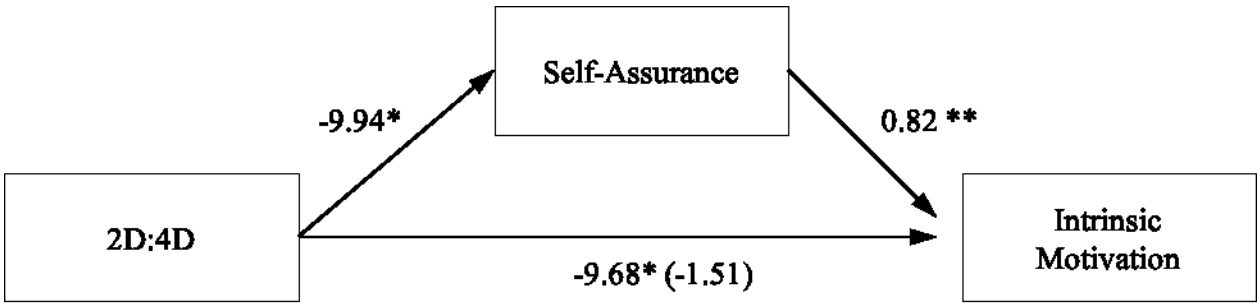

Figure 7. Model of unstandardized coefficients for the relationship between 2D:4D ratio and intrinsic motivation as mediated by self-assurance, controlling for gender. The unstandardized regression coefficient between 2D:4D and intrinsic motivation, controlling for self-assurance and gender, is in parentheses. * = $p < .05$, ** = $p < .01$, (all one-tailed).

The second model tested if 2D:4D predicted integrated sport motivation, and also if this relationship was mediated by self-assurance. The indirect effect was tested using bootstrapping procedures wherein unstandardized indirect effects were computed for each of 5,000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 95th percentile (one-sided). The bootstrapped unstandardized indirect did not cross zero, thus the indirect effect was statistically significant (see Figure 8, Table 6). Specifically, the indirect effect accounted for 67% of the (non-significant) direct effect, while both 2D:4D and self-assurance explained 23% of the variance in integrated motivation.

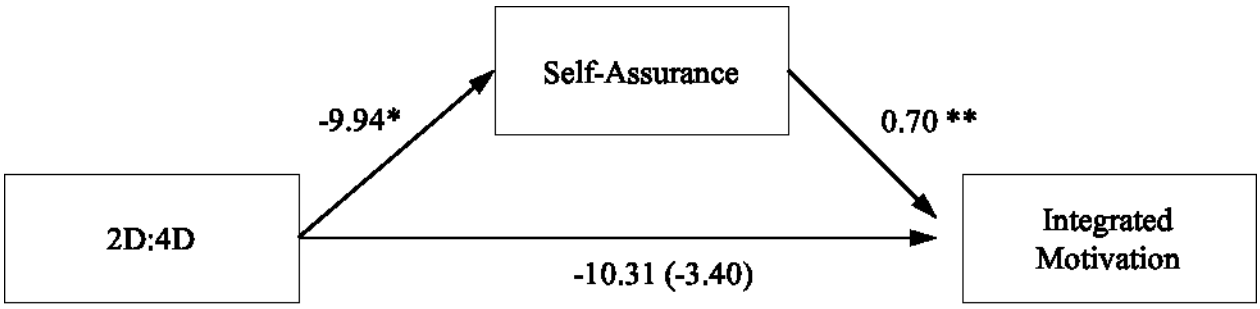

Figure 8. Model of unstandardized coefficients for the relationship between 2D:4D ratio and integrated motivation as mediated by self-assurance, controlling for gender. The unstandardized regression coefficient between 2D:4D and integrated motivation, controlling for self-assurance and gender, is in parentheses. * = $p < .05$, ** = $p < .01$, (all one-tailed).

The third model tested if 2D:4D predicted amotivation, and also if this relationship was mediated by self-assurance. Again, the indirect effect was tested using bootstrapping procedures wherein unstandardized indirect effects were computed for each of 5,000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 95th percentile (one-sided). The bootstrapped unstandardized indirect did not cross zero, thus the indirect effect was statistically significant (see Figure 9, Table 6). Specifically, the indirect effect accounted for 49% of the direct effect, while both 2D:4D and self-assurance explained 10% of the variance in amotivation.

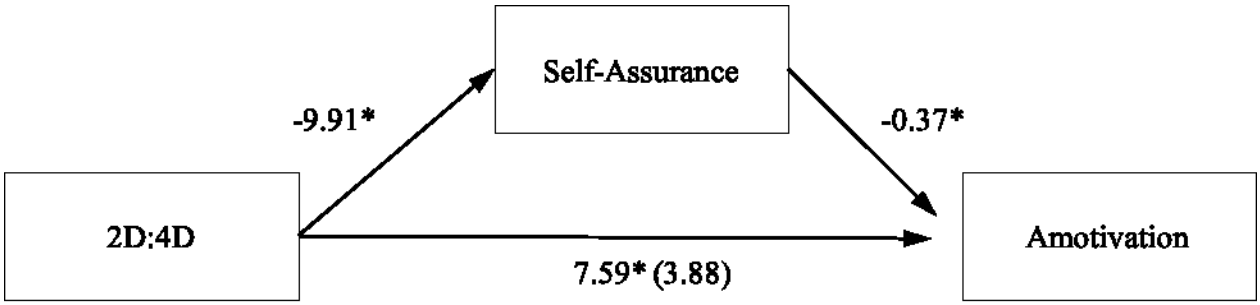

Figure 9. Model of unstandardized coefficients for the relationship between 2D:4D ratio and amotivation as mediated by self-assurance, controlling for gender. The unstandardized regression coefficient between 2D:4D and amotivation, controlling for self-assurance and gender, is in parentheses. * = $p < .05$, ** = $p < .01$, (all one-tailed).

Table 6

Unstandardized indirect effects of 2D:4D on sport motivation via self-assurance.

Models	R^2_{adj}	Indirect Effect	P_m	BCa 95% CI Lower	BCa 95% CI Upper
Model 1: Intrinsic Motivation[a]					
2D:4D Ratio	.43	-8.17	.84	-16.05	-2.58
Model 2: Integrated Motivation[a]					
2D:4D Ratio	.23	-6.91	.67	-14.85	-1.78
Model 3: Amotivation[b]					
2D:4D Ratio	.10	3.71	.49	0.78	8.97

Note. P_m = percent of total effect (c) accounted for by indirect effect (a *b). BCa = bias corrected and accelerated, controlling for gender. CI = confidence interval. Bootstrap resampling involved 5000 iterations. [a] = sample size of 45. [b] = sample size of 44.

Discussion

This study aimed to test a foundational assumption of the ISM, that variation in sport motivation should be partly explained by differences in prenatal testosterone exposure, and that this relationship should be mediated by feelings of self-assurance. Results demonstrated that 2D:4Dwas directly related to intrinsic and amotivation, but not integrated sport motivation. Nonetheless, there were significant indirect effects of 2D:4D on intrinsic, integrated and amotivation through feelings of self-assurance. These findings suggest that 2D:4D may have important effects on motivation, although caution is warranted regarding the interpretation of the ways in which the indirect relationship may manifest for integrated sport motivation.

2D:4D and Status Striving

Although the design used in this study cannot determine causality, the temporal criterion of causality seems to be satisfied given that 2D:4D is an indicator of prenatal testosterone exposure. These findings align with the ISM, which proposes that sport motivation is impacted by intuitions stemming from a system that evolved to regulate status striving (see Chapter 3; Balish et al., 2016). Previous research has linked testosterone exposure to a number of different aspects of status striving (for a review see Eisenegger, et al., 2011). Indeed, individuals with relatively higher exposure to testosterone are more confident (Johnson, McDermott, Barrett, Cowden, Wrangham, McIntyre, & Rosen, 2006), and engage in behaviour intended to dominate others (Mazur & Booth, 1998), which includes riskier behaviour (Stanton, Liening, & Schultheiss, 2011).

There are two plausible pathways through which 2D:4D could affect sporting outcomes: (1) direct psychological changes, and (2) physiological changes which lead to different environmental experiences, which in turn create psychological changes. t Self-assurance mediates the relationship between 2D:4D and sport motivation. Although this result aligns with the hypothesis that prenatal testosterone exposure acts directly on one's psychology, it is not possible to rule out indirect physiological pathways. More sophisticated experimental studies are needed to disentangle the specific pathways through which prenatal testosterone exposure might influence feelings of self-assurance and sport motivation. Indeed, disentangling direct and indirect pathways would be important for the entire field of research on prenatal testosterone exposure, which has yet to disentangle these pathways in humans (for a discussion see Berenbaum & Beltz, 2011; Eisenegger, et al., 2011).

Overall, the findings demonstrate how an evolutionary informed approach may reveal novel and productive hypotheses within the study of sport psychology. In particular, the ISM should orient sport psychology research towards the proposed regulatory systems that produce status striving intuitions. On this view, sport motivation ultimately stems from a regulatory system that evolved to maximize, maintain, and signal social status (Balish et al., 2016). Rather than function as a simple binary switch that motivates status striving motivation when any opportunity is presented, this status system should be computationally complex; it should compute, among other factors, the likelihood of being successful in a task, along with the potential status benefits/costs of being successful/unsuccessful. From the view of the ISM, the question is how prenatal testosterone affects this computational structure? Does it supress the anticipated status costs of being unsuccessful, does it increase anticipated status benefits of being successful, or does it affect these computations at all? The fact that self-assurance mediates this pathway seems to suggest that testosterone may impact how one perceives their own ability relative to others. Of note, a recent review highlighted four mechanisms through which testosterone may impact status striving behaviour, namely (1) threat vigilance, (2) reward processing, (3) fear reduction and (4) stress resilience (Eisenegger et al., 2011). Future research should investigate how these mechanisms may determine how the proposed status system produces feelings of self-assurance.

Self-Assurance and Sport Motivation

Self-assurance mediated the associations between 2D:4D and sport motivations. This finding also aligns with the ISM, which predicts that testosterone should impact sport motivation, given that sport motivation takes the form of status striving (see Chapter 3; Balish et al., 2013) and that status striving is linked to testosterone (Eisenegger et al.,

2011). The scale used to measure self-assurance in this study conceives of self-assurance as a positive emotion that occurs in the form of feelings (e.g., intuitions; Watson & Clark, 1999). However, it is an open question if self-assurance can be statistically differentiated from more common predictors of sport motivation, such as pride (see Chapter 4) and self-efficacy (see Bandura, 1989, 2001). Indeed, while self-assurance, pride, basic need of competence, and self-efficacy are theoretically distinct, their operational definitions often contain significant overlap (for a discussion see Williams & DeSteno, 2008). Further research is needed to isolate self-assurance as a variable that offers unique contributions to our understanding of sport motivation. One study has examined self-assurance in sport, wherein researchers found that self-assurance differentiated sport participants from non-sport participants (Kanniyan, George, & Valiyakath, 2015). The Ism will help guide future studies that aim to test the proposed relationships between 2D:4D, self-assurance, pride and sport motivation.

Future Research

If, in fact, 2D:4D impacts intuitions regarding status striving in sport, then the effects may range across a number of psychological and behavioral outcomes in sport. In particular, there are two popular areas of research that may benefit from investigating the role of 2D:4D: (1) the positive long-term outcomes of playing multiple sports throughout development (i.e., sampling), and (2) the relationship between motivational climate and sport motivation.

The International Society of Sport Psychology published a position-stand, which claimed that early diversification of sport participation is associated with a range positive outcomes at later ages, including positive, long-term sport involvement, enhanced life skills, and a solid foundation for intrinsic motivation (Côté, Lidor, & Hackfort, 2009; see

also Coté, Horton, MacDonald, & Wilkes, 2009). Nonetheless, the research supporting these claims is entirely based on correlational data from retrospective reports (e.g., Côté, Lidor, & Hackfort, 2009). It seems that none of the relevant studies have attempted to rule out plausible common causal variables. For example, perhaps youth that prefer to sample at early ages are also the youth who acquire these positive outcomes based on who they are, not what they experienced. One common causal variable that might help explain these correlational findings is exposure to prenatal testosterone. Prenatal testosterone exposure is associated with a preference for physical competition, including self-selection into athletic contexts (Tlauka, et al., 2008).

Motivational climate refers to "individuals' composite views concerning the situationally emphasized goal structures operating in an achievement setting" (Duda, 2001, p. 144). Within sporting contexts, there are usually two commonly characterized motivational climates. In particular, an ego-oriented climate occurs when perceptions of success follow from evaluations of superiority among peers and teams (i.e., peer-referenced). Most research that has examined motivational climate, has viewed 'climate' as a socio-cultural product of the coach. Accordingly, coach-initiated motivational climate refers to achievement-related norms promoted by a coach, and follows the same dual characterization of task and ego oriented climates (Smith, Smoll, & Cumming, 2009). In light of the ISM, perceptions of coach-initiated ego motivational climate may, in part, reflect the athletes underlying intuitions, not their objective assessment of their coach's behaviour. In other words, responses to such measures may be biased by underlying intuitions, especially considering that items used to measure a coach-initiated ego climate concern patently negative claims regarding value-laden intentions of the coach (e.g., Winning games is the most important thing for the coach; Walling, Duda, &

Chi, 1993). Athletes 2D:4D might explain variation in perceptions of an ego-climate. Specifically, those with lower 2D:4D (higher testosterone exposure) should perceive lower levels of coach-initiated ego-climate. Further, those with lower 2D:4D (higher testosterone exposure) who also perceive high levels of coach-initiated ego-climate may find themselves in an environment that suits their preference for competition. As a result, they will be more inclined to be satisfied and intend to return in the future compared to those with lower testosterone exposure.

Limitations

This study has several limitations. First, I employed a manual measure of 2D:4D using digital calipers. While this methodology has been reported to be reliable, using digital photos (scans) of participants hands and measuring digit length using software may increase the accuracy of 2D:4D (Caswell & Manning, 2009). Further, a second experienced research assistant should be included to test issues associated with measurement reliability (i.e., inter-rater reliability).

Second, the correlational design of this study does not permit causal claims regarding the demonstrated relationships, although the nature of the measurements (i.e., prenatal) satisfy temporal criteria for causality. Future research should focus on naturally occurring experiments (i.e., Congenital Adrenal Hyperplasia) or employ experimental designs that manipulate circulating testosterone and measure effects on motivation, perceptions, and behaviour within a controlled sport setting.

Third, given the claims of universality when proposing evolved adaptations (i.e., reliably developing aspects of human nature) future research should examine the predictive capacity of 2D:4D in disparate societies. Indeed, previous research has shown

that 2D:4D varies across countries (Manning, Fink, & Trivers, 2014) thus suggesting that the findings demonstrated in this study could vary across countries.

Fourth, this study examined a cross-sectional dataset to test meditation effects. While the independent measure, 2D:4D, can at least be confidently assumed to have occurred prior to self-assurance and motivation, a cross-sectional data is nonetheless one of the weakest forms of data to test mediation. Future studies should aim to use experimental and longitudinal data given that the casual hypothesis being proposed have temporal sequences.

Finally, this study hypothesized and found that 2D:4D should predict sport motivation acting through psychological mechanisms (i.e., self-assurance). Given there are two pathways through which 2D:4D might impact motivation, it is important for future studies to control for mechanisms through which 2D:4D might indirectly impact motivations, perceptions, and behaviours. For example, 2D:4D is associated with BMI (Fink, Neave, & Manning, 2003), which is associated with physical activity (Vierling, Standage, & Treasure, 2007) and athletic ability (Haugen, Ommundsen, & Seiler, 2013). It is plausible that those with larger BMI are less athletically competent and thus less motivated. Further, those with greater BMI may also be less favoured by coaches, which might increase negative perceptions of their coach. Beyond BMI, objective measures of athleticism using fitness tests may be the best measures that can help differentiate the psychological and physiological pathways through which 2D:4D might affect motivation, perceptions, and behaviour.

Conclusion

In closing, this study found that prenatal testosterone exposure, as indexed by 2D:4D, predicts intrinsic, integrated, and motivated forms of sport motivation, and that

these relationships are mediated by feelings of self-assurance. These hypotheses follow from the ISM, and serve as the first empirical support for the biological basis of the proposed status system that produces sport motivation. Future research is needed not only to replicate these findings in larger and more diverse samples, but also to disentangle the direct (psychological) and indirect (physiology) pathways. If future research substantiates these findings, it may be necessary to reconsider rationalist models of motivation for sport.

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Chapter 6 Discussion

Throughout this thesis it has been repeatedly argued that sport is—on the whole—a social good. Sport participation is a source of positive affect (Snyder et al., 2010; Vilhjalmsson & Thorlindsson, 1992), it promotes healthy behaviour (Khan et al., 2012; Pate et al., 2000), is deeply intertwined with local and global economies (e.g., Baade & Matheson, 2004), and preliminary work has linked sport to positive youth development (Fraser Thomas, Côté, & Deakin, 2005; Holt, 2008; Marsh & Kleitman, 2003; Oler et al., 1994). This is why the apparent decreases in sport participation, at least in Canada (Ifedi, 2008; Statistics Canada, 2013), are seen by applied sport psychologists as troubling. Aligning with the value-laden aim to mitigate decreases in sport participation, this thesis concerned the nature of sport motivation, and in particular, youth sport attrition.

To address the question of youth sport attrition, one needs a theoretical framework and model of how youth sport motivation occurs. However, in recent years it has become clear that prevailing models of motivation that could guide a nuanced study of youth sport attrition are, simply put, outdated. Indeed, as has also been repeatedly argued throughout this thesis, prevailing theories and models that concern motivation in physical activity contexts have largely failed to explain relevant findings, and have also failed to generate novel, stimulating hypotheses that could further reveal the nature of motivation in physical activity settings (Hall, 2014; Rhodes, 2014; Sniehotta, Presseau & Araujo-Soares, 2014, 2015). To study youth sport motivation, and in particular, youth sport attrition, there is a need for novel models of motivation that fundamentally contrast with the increasingly criticized prevailing models. Moreover, the field of sport psychology would benefit immensely from a novel model that could not just synthesize disparate

findings, but also offer predictions that contrast with those of prevailing models of motivation. These contrasting predictions would allow researchers to better design studies that test competing hypotheses, and conduct less confirmatory oriented research. Importantly, the former is often understood as a better way of doing science (Popper, 2005).

The fact that the time was right to develop and test a novel model of sport motivation was the impetus for this thesis, and accordingly, became its purpose. To develop a truly novel model of sport motivation, I employed a novel, interdisciplinary approach. This approach is best characterized by the paradigm shift in psychology, described as evolutionary psychology, which involves the integration of ultimate explanations (i.e., why does a psychological mechanism exist) and proximate explanations (i.e., how does a psychological mechanism work; see Balish, Eys, & Schutte-Hostedde, 2013). This evolutionary informed approach allowed me to ask new and exciting questions regarding sport motivation. For example, while sitting at my desk planning and writing this thesis, I would look out my office window at a soccer field where youth would often practice and play (see Figure 10). Why are these hairless primates chasing a leather ball around a field? Why would evolved organisms engage in such metabolically costly behaviour? Is this behaviour produced as a by-product (i.e., bug in the system) of some other adaptation, or is it produced by an adaptation (i.e., a feature of the system) to achieve some goal that would have been adaptive in the ancestral past? These questions, to my knowledge, were yet to be taken seriously in the field of sport psychology. What became clear, is that they have direct implications on how we model sport motivation.

Figure 10. Youth playing sport on Wickwire field at Dalhousie University.

To realize the purpose of this thesis I laid out four objectives. The first objective was to conduct a systematic review of the correlates of youth sport dropout. This objective resulted in a published manuscript (see Balish McLaren, Rainham, & Blanchard, 2013) which reviewed 23 empirical studies of youth sport dropout that used a dichotomous measure. Across different analytic levels (biological, intrapersonal, interpersonal, institutional, community, policy), 141 different correlates were identified and qualified according to a quality-rating scale adapted from similar reviews. The vast majority of correlates occurred at the intrapersonal (90/141) and interpersonal levels (43/141), and were social in nature. Of the 143 correlates, 11 were categorized as having high quality of evidence and 10 as having a low quality of evidence, and again, 20 of these 21 correlates occurred at the intra and interpersonal levels. Overall, results suggested that the strongest correlates of youth sport dropout are social in nature and concern "rationalist" constructs, such as beliefs, perceptions, and anticipations. In

particular, the most supported theory was basic needs theory (e.g., needs for autonomy, competence, & relatedness), which is a sub theory of self-determination theory (Ryan & Deci, 2000). However, what was also revealing was the absence of correlates that concern intuitions (e.g., emotions) and the lack of research focused on lower (e.g., biological) and higher (e.g., policy) analytic levels. Delving further into the theories that guided these studies revealed a neglect for biological factors and how they may be related to sport motivation and dropout. Given that this review was framed within a social-ecological model, one question that arose was, why have so few studies branched out from the intra and interpersonal levels? The answer seemed to be the lack of an interdisciplinary approach that could synthesize theories and findings across analytic levels, and actually predict how biological factors might influence sport motivation or dropout.

The second objective was to synthesize relevant findings regarding sport motivation in sport with the aim to develop a novel model of youth sport motivation. Achieving this objective required producing an in-depth review that, first, distilled prevailing theories and models into their basic assumptions. For conceptual clarity, I described prevailing models as "rationalist models" given that their most basic, shared assumption is that sport motivation and behaviour is entirely the product of a rational decision making process in which individuals consult their preferences (e.g., need for autonomy) and consciously calculate the costs of benefits of different behaviours. After synthesizing relevant findings from sport psychology and neighbouring fields, I proposed an intuitionist model of sport motivation (ISM) in which intuitions, emerging from evolved regulatory systems, guide reasoning and sport behaviour. More simply, intuitions come first, strategic reasoning second, if at all, and behaviour third. In particular, the ISM argues that much of sport motivation is actually status striving, and that this motivation is

guided by intuitions that stem from an evolved system that aims to maximize, maintain and signal one social status. The value of the ISM, is that it not only explains previously disparate findings, but also makes a number of predictions that contrast with those from rationalist models. Although the worth of the ISM will be revealed through future research, it nonetheless advances the field by offering different predictions that can be tested against those from rationalist models.

The third objective involved testing the hypothesis that feelings of pride and shame predict intentions to return to sport, and if these relationships exist when controlling for basic needs proposed by self-determination theory (Ryan & Deci, 2000). This objective followed from the ISM, which predicts that intuitions (e.g., self-conscious emotions) are the primary drivers of motivation, reasoning, and behaviour. Specifically, this study hypothesized that two self-conscious emotions, pride and shame, would predict intentions to return to youth sport, even when controlling for basic needs of autonomy, competence, and relatedness. The results of the study largely supported the hypothesis—pride, but not shame, predicted intentions to return even when controlling for basic needs. The results further demonstrated that while competence and relatedness both predicted intentions to return, these relationships were rendered insignificant when controlling for pride and shame. This suggest that pride and shame may be more proximal to intentions to return than are basic needs, or that the scales that measure basic needs are tapping into aspects of pride and shame.

The fourth objective involved testing the hypothesis that a biological marker of prenatal testosterone exposure—2D:4D—predicts sport motivation, and if feelings of self-assurance mediate this relationship. This objective also followed from the ISM, which assumes most sport motivation should take the form of status striving, and given

that testosterone exposure has been linked to status striving, testosterone exposure during critical periods of development should predict sport motivation. The results from this study demonstrated that a biological marker of prenatal testosterone exposure—2D:4D—predicts intrinsic and amotivated forms of sport motivation, and that these relationships are largely mediated by feelings of self-assurance. This finding demonstrates how the ISM can foster novel hypothesis that span different disciplines. Although this study has a number of limitations, it nonetheless suggests that 2D:4D may be a worthwhile avenue of future research.

The following sections highlight the two most important contributions of this thesis to the field of sport psychology. These include the theoretical contributions of the ISM and the benefits of linking biology and sport psychology. The discussion closes by highlighting future directions and summarizing the overall contribution of this thesis.

The Promise of the Intuitionist Model of Sport Motivation

Each paradigm shift in psychology can be understood as a reaction to the perceived problems in previous paradigms (Benjamin, 2007). The behaviourist paradigm, with its sole focus on empirical methods and observable behaviour, was a reaction to the "arm-chair" non-empirical musings that came before it. In response to behaviorism modeling humans as environmentally-determined, the subsequent the rationalist movement championed individuals' "freewill" or volition as the dominant causal driver of behaviour. The rationalist paradigm presented a thesis that humans are rational creatures ("Homo Economicus") that navigate the world in an individualistic and efficacious manner, typically toward actions that maximize their own utility (for a discussion see Persky, 1995). At the same time, and with the advent of information theory, cognitive revolution overtook behaviourism as a dominant perspective in

psychology by "reverse engineering" the mediating psychological mechanisms between environment and behaviour, which largely concerned conscious thoughts. Now, however, a new intuitionist paradigm is occurring throughout the psychological sciences (e.g., Haidt, 2001; see also Cosmides & Tooby, 2013). The intuitionist paradigm is a reaction to the over-estimation of the role of rational deliberation, and the apparent neglect for the functional role of intuitions (e.g., emotions) and the evolved systems that produce them. This shift was best demonstrated in moral psychology where Haidt (2001) has argued that "The affective system has primacy in every sense: It came first in phylogeny, it emerges first in ontogeny, it is triggered more quickly in real-time judgments, and it is more powerful and irrevocable when the two [dual] systems yield conflicting judgments" (p. 820).

Importantly, the ISM presented in this thesis preserves the functional role of reasoning and deliberation in sport motivation and behaviour. Nonetheless, the ISM characterizes reasoning and deliberation in a much different manner then rationalist models. From an intuitionist view, reasoning does not function like a judge or scientist, trying to determine the most rational action. Rather, preceding intuitions guide reasoning, such that reasoning functions like a lawyer or press-sectary, trying to defend one's intuitions. This simple difference regarding how reasoning is modeled should lead to a proliferation of research that aims to test how reasoning about sport and exercise is biased by underlying regulatory systems. For this area of research, intuitions related to pride should bias reasoning, such as when a young athlete believes they have a high likelihood of playing professionally.

Another contribution of the ISM is that it orients research attention towards intuitions and the regulatory systems that produce them. Specifically, the ISM promotes

an evolutionary informed approach to understanding intuitions and their corresponding regulatory systems. Recall that regulatory systems are psychological adaptations that evolved to regulate a resource, either social or physical. Specific regulatory system evolved to solve specific needs in the ancestral past, whether that be the regulation of social status through feelings of pride (see Chapter 3), or the regulation of one's own welfare through feelings of anger (e.g., Sell, Tooby & Cosmides, 2009; Sell, 2011). Accordingly, each regulatory system should use different cues as inputs, perform different computations, and output different motivations and behavior. If this is true, then there is a lot of work to be done—we need to identify each regulatory system and map each of their computational structures. This is one reason why behavioral experiments will be vital to the progress of sport psychology.

Finally, the ISM should benefit the field of sport psychology by increasing understanding of why behavior occurs, not just how it occurs. Understanding *why* some psychological mechanism exists, or some behavior occurs (i.e., ultimate explanations), should help refine normative claims being made by researchers regarding the worth of participating in sport and exercise. Consider how rationalist models and intuitionist models differentially impact normative claims. Rationalist theories assume that motivation and behavior is the sole product of a rational decision making process, and that individuals try to maximize their satisfaction. If a young athlete decides to dropout of sport, a rationalist psychologist is then tempted to assume that the young athlete lacks the understanding of what is rational, or is simply not performing the cost-benefit calculations correctly and thus is being irrational.

In contrast, if motivation and behavior are guided by intuitions stemming from underlying regulatory systems that evolved to regulate some social resource, then

perhaps, dropping out of sport may be a behavior that helps to regulate some social resource? For example, if most sport motivation occurs as status striving, and if an athlete's status system produces intuitions that lead a child away from sport, it may be because sport is not an area where that athlete can best acquire status. Perhaps that athlete chooses to dropout, and finds a new activity where they can gain status and the benefits that come with it. From an intuitionist view, athletes who dropout may be doing so for reasons that, to them, are legitimate; they want to strive for status in a different activity where they have a better chance of success.

Biology is Destiny, Only if we Ignore it

This study found that 2D:4D—an marker of prenatal testosterone exposure—is related to sport motivation, and that feelings of self-assurance mediate these relationships. While this finding provides further preliminary evidence for the ISM, it is a novel, non-obvious finding mainly because sport psychology research has largely ignored hypotheses that span biology and psychology. Given that sport psychology is an applied social science where the primary aim of both academic institutions and funding agencies is to generate benefits for society, it is understandable that researches have viewed biology as non-modifiable, and thus ignored it. However, there are two main reasons why ignoring biological influences will, in the end, hurt the applied aims of sport psychology.

One reason why sport psychologists should study biology is that it will help minimize the over-estimation of environmental influences on athletes' psychology and behaviour, and in turn, help prevent misguided interventions that could do more harm than good. For an example, consider the increasing consensus that (1) playing a diversity of sports at younger ages, and (2) that a high amount of deliberate play (i.e., an informal, intentional, and voluntary form of play that involves sport), are both associated with

positive outcomes later in life, including positive, long-term sport involvement, enhanced life skills, and a solid foundation for intrinsic motivation (for discussions see Côté, Lidor, & Hackfort, 2009; see also Coté, Horton, MacDonald, & Wilkes, 2009). Throughout the relevant literature, these associations are often discussed as causal in nature, meaning that playing multiple sports and engaging in deliberate play will lead to later benefits, on average (Côté, et al., 2009a; Côté et al., 2009b). However, the entire base of evidence used to support this claim is not only correlational in nature, but also neglects studies that link biological factors to childhood play behaviours, and thus could constitute a common causal variable. First, prenatal testosterone exposure is correlated with male-typical childhood play and activity patterns (for a review see Berenbaum & Beltz, 2011), which is in turn correlated with sport participation at later ages (Cardoso, 2009; Giuliano, Popp, & Knight, 2000). Second, prenatal testosterone exposure, as measured by 2D:4D, predicts self-selection into athletic contexts (Tlauka, et al., 2008). It may be that youth who were exposed to higher levels of testosterone at critical periods of development tend to play more sports during development, simply because they prefer physical competition. If participation in deliberate play and positive sport experiences and outcomes late in life can both be attributed to prenatal testosterone exposure, then the position stand by the International Society of Sport Psychology (Côté et al, 2009) may be ineffective, or worse, harmful.

The second reason why biology is important to sport psychology, is that many of the most central mechanisms that are considered modifiable can be better understood through a biological lens. Indeed, consider that if the ISM is correct that intuitions drive reasoning and behaviour, then the best leverage points for behaviour change are the evolved regulatory systems that produce intuitions. However, to leverage these systems

requires understanding their evolved computational structure—what type of cues they input, what computations they perform, and what type of output they produce (Cosmides, & Tooby, 2013; Balish et al., 2013). For example, if sport motivation occurs as a form of status striving, then researchers who want to promote sport motivation need to know how to design sport such that youths' status systems calculate that sport is a worthwhile context to acquire status, and produce corresponding intuitions. In this case, as should be the case with many other forms of motivation, understanding the evolutionary theory and biology of such systems should ultimately facilitate the creation of productive interventions.

Future Research

At a general level, it is vital that sport psychology test the basic assumptions of prevailing rationalist models. It is an genuine assumption, not an established truth, that motivation and behaviour stems from a rational decision making process in which people try to consciously satisfy their preferences. At a more granular level, there are three avenues of future research that should be profitable: (1) employing experimental designs and objective measures to test the competing causal claims between intuitionist and rationalist models, (2) testing if and how intuitions guide (i.e., bias) reasoning toward adaptive behaviour, conclusions, and decisions, and (3) exploring how differences in biology (e.g., testosterone exposure) can help explain intuitions, reasoning, behaviours, and outcomes in sport. These research avenues are described in the following sections.

One reason why experimental designs and objective measures are needed to test rationalist and intuitionist models, is that the ISM predicts that self-report measures should be biased by intuitions. This creates an empirical problem of differentiating constructs that align with rationalist models, and those with intuitionist models, thus

limiting researchers' ability to test competing hypotheses. This problem is further compounded given that operational definitions of pride overlap with measures of competence (e.g., Deci & Ryan, 2000) and self-efficacy (e.g., Bandura, 2001). Consequently, it may be necessary that sport psychologists take up more sophisticated experimental methods and employ more objective measures (e.g., Williams & DeSteno, 2008). The added benefit of using experimental designs and objective measures is that they both align with intervention research, which is ultimately needed if sport psychology is to achieve its mission to improve sport in society.

Another profitable research avenue involves examining if and how intuitions guide reasoning processes (i.e., deliberation) toward the adaptive outcomes that the underling regulatory systems evolved to produce. This may be best achieved through priming studies. Priming refers to an implicit retention effect in which an exposure to a stimulus at time one impacts a response to a different stimulus at time two. Although priming methodologies have continued to be used in the study of psychology (e.g., Bargh, & Chartrand, 1999), their reliability has been recently questioned (Open Science Collaboration, 2015). Nonetheless, unconscious-priming methodologies wherein participants are unaware that they have been purposely primed by the experimenter have been used to test central assumptions regarding the role of conscious reasoning in the production of motivation and behaviour (see Bargh, et al., 2001). For example, asking individuals to remember words related to autonomy, rather than neutral words, increases perseverance in a subsequent, seemingly unrelated task of learning an effortful motor skill (Radel, Sarrazin, & Pelletier, 2009).

Rationalist theories in sport psychology assume that reasoned self-appraisals are the logical products of a rational decision making process that uses self-referenced

information from a number of sources. For example, Bandura (2001) claimed that self-efficacy is shaped by consciously inputted information from (a) performance experiences, (b) social modelling, (c) social persuasion and (d) the conscious interpretation of one's physiological arousal. However, the ISM claims that self-appraisals are largely produced by evolved intuition-producing systems (e.g., implicit computations). If this is true, that priming the status system should influence not only motivation, but also one's conscious self-appraisals (e.g., self-efficacy, intentions ton train, outcome expectations).

A third avenue for future research should investigate how differences in biology influence various psychological and behavioural outcomes in sport. As highlighted earlier (see Chapter 5), prenatal testosterone may be a common causal variable that explains established links between early experiences in sport, and later benefits. Further, 2D:4D might help explain the gender gap in sport. Numerous findings have demonstrated that males participate in sport, especially team sport, more than females (Deaner et al., 2012; Balish, Deaner, Rainham, Blanchard, accepted) and that these differences in participation seem to be due to differences in interests (for an in-depth review see Deaner, Balish, & Lombardo, 2015). Perhaps prenatal testosterone exposure accounts for much of the variation that gender predicts in sport participation?

Finally, a fourth avenue for future research could concern actual social interventions that target intuitions (and the regulatory systems that produce them). For example, as mobile platforms are becoming increasingly popular and integrated within athletic organizations, it may be possible to develop learning modules or actual training programs that helps coaches target intuitions. For example, programs that help coaches target athletes' feelings of pride. Researchers could then, using experimental designs, compare them against learning modules or training programs that teach coaches to targets

athlete's rational calculations. Testing these two types of training programs against control cases will help to test the efficacy of targeting intuition and targeting rationalist thoughts, and which are the better leverage points for behaviour change.

Conclusion

In the beginning, this thesis was undertaken to help improve our understanding of youth sport attrition. In the end, this thesis offered a novel model of sport motivation that may stimulate a number of productive avenues of research in sport psychology. The empirical aspects of the thesis demonstrated that pride is a strong predictor of intentions to return to sport, and may be more proximal then the supposed "basic needs". It was also demonstrated that 2D:4D predicted sport motivation, and that feelings of self-assurance mediated these relationships. Nonetheless, the ISM and this preliminary evidence involves a number of limitations, the most prominent being that the ISM cannot be fully validated or falsified by the preliminary studies proposed in this thesis (Chapters 4 - 5). Further, while the ISM was positioned as a competing model to those rationalist models, future research is needed to test their relative worth to the field, including interventions that can improve sport throughout society. At minimum, however, this thesis should promote the testing of contrasting assumptions of intuitionist and rationalist models.

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Appendix A Child Assent Form

Assent Form

Project Title: Adaptive Regulation Theory of Motivation in Sport (ARMS)

Project Coordinator: Shea Balish, **Phone**: 902-266-3674, **Email**: Shea.Balish@dal.ca

Primary investigator: Dr. Chris Blanchard Phone: 902-473-3789, **Email**: Chris. Blanchard@Dal.ca

Funders and Support: This study is funded by the Social Science and Humanities Research Council of Canada (SSHRC). This study is supported by Sport Nova Scotia and the Department of Health and Wellness.

INTRODUCTION and PURPOSE

You are invited to take part in a research study that aims to understand motivation for sport. Specifically, why some youth stay engaged in sport, and others drop out. The study asks you to answer a number of questions related to your social experiences in sport, including questions related to how you compare with others, and how they compare with you. With this study we hope to better explain why some athletes stay in sport and other do not.

Anyone can participate, as long as you can read English, are between 13 and 16 years of age, and currently participate in sport. Shea Balish, a doctoral student at Dalhousie University, is coordinating this research. Taking part in this study is completely voluntary and you may choose to stop at any time without penalty.

The study is described below. This description tells you about both the benefits and the risks. You should discuss any questions you have about this study with Shea Balish (Shea.Balish@dal.ca - 902-266-3674).

STUDY DESIGN (What you will be asked to do)

You will be asked to complete a questionnaire twice—once near the beginning of your athletic season, and once again near the end. The questionnaire includes questions relating to (1) your demographics (e.g., age, height, and gender), (2) your history of sport participation, and (3) your social experiences in sport, such as your perceptions of how teammates may support or punish you.

Please note that this survey will only commence once at least 80% of your teammates are given consent to participate in this study. This is because you will be asked to rank your teammates on their level of talent and friendliness. However, you will not be asked any questions regarding teammates who are not given consent to participate. You will be asked that you do not share your answers to any questions regarding teammates. In other words, please do not share your answers with others.

The questionnaire will be asked to complete will take approximately 25 - 35 minutes of your time. You have the opportunity of completing the survey in a digital format, or a paper-based format. If you have any problems or questions, simply contact the coordinator Shea Balish (Email: Shea.Balish@dal.ca, Phone: 902-266-3674) and he will

assist you in accessing the questionnaire. Participation is completely voluntary and you may refuse to participate in any component of the research study, at any time.

POSSIBLE HARMS

Participating in this study will involve answering questions about your personal social experiences in sport, including your past behavior in sport. For example, you will be asked to rank your teammates skill level and how each teammate would help you if you made a mistake (e.g., How talented is John?; Would Sarah support me if I made a mistake?). Your teammates will be asked the same questions about you. Although your teammates and you will be asked to keep your answers to the survey private, we cannot guarantee that information regarding how others view you will not be shared among the team.

POSSIBLE BENEFITS

You will be eligible for a prize draw for a new Apple IPad Mini (retail value ~ $ 419), for each of the two surveys. In other words, if you agree to take both the first and second surveys, you will be entered into two separate prize draws, each for an Apple IPad Mini. You do not need to complete the entire survey to qualify for the prize draw. Beyond this prize draw, this survey completion will allow the researchers to better understand what aspects of sport best motivate youth to remain engaged in sport.

CONFIDENTIALITY

You do not need to provide your name on the questionnaire, only on this assent form. Each questionnaire will have a personalized code (last letter of your first name, day of birth, and the first letter of your last name); this is for the sole purpose of linking the two questionnaires. Although each questionnaire will have the names of members of your team/club, including your name, others will not be able to link you to the responses you made on the questionnaire. All data will be made anonymous (i.e., unknown to other people) and will be kept in a secure computer file at Dalhousie University. No one other than the researchers will have access to your responses. Once data collection and data analysis from the project has been completed, your personal code will be destroyed. All computer files of the data will be stored on a password-protected computer in Shea Balish's locked office at Dalhousie.

WITHDRAWAL FROM THE STUDY

Participation in this research is completely voluntary and you may withdraw from the study at any time. In addition, you may leave any questions in the survey unanswered. You may withdraw your data up to the end of the data collection period by providing the researchers with your personal code. However, it will not be possible to withdraw your data once the data is analyzed and examined.

DEBRIEFING

If you wish to receive a summary of the results after the study has been completed, please provide your email address at the end of this informed consent (on the next page). This email address will only be used to email or mail you a short (300 words) summary of the results and will be destroyed (i.e., deleted) once this summary has been sent to you.

QUESTIONS OR PROBLEMS

Please feel free to ask the researchers about the nature of this study. We will accept all collect calls.

Project Coordinator: Shea Balish **Email:** Shea.Balish@dal.ca, **Phone:** 902-266-3674

Primary investigator: Dr. Chris Blanchard Phone: 902-473-3789, **Email**: Chris. Blanchard@Dal.ca

Or, in the event that you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Catherine Connors, Director of Dalhousie University's Office of Human Research Ethics Administration Phone: 494-1462 E-mail: Catherine.Connors@dal.ca

I have read the above information describing the research study, and I agree to participate. I understand my participation is voluntary, and I may withdraw from the study at any time for any reason. My signature below shows that I agree to participate in the study. By assenting, I understand that I have not waived any rights to legal recourse in the event of research-related harm.

_____ _____

Name (please print) Signature

_____

Date

If you are interested in being provided the results of this study once it has been completed, please provide your email address below.

By giving my email address, I understand my email address will only be used for the results of the study and will not be connected to the information I provide in the questionnaire and will be deleted after the results are provided.

Email Address:_____

Thank you for completing this Assent form.

Appendix B Parental Consent

Consent Form

Project Title: Adaptive Regulation Theory of Motivation in Sport (ARMS)

Project Coordinator: Shea Balish, **Phone**: 902-266-3674, **Email**: Shea.Balish@dal.ca

Primary investigator: Dr. Chris Blanchard Phone: 902-473-3789, **Email**: Chris. Blanchard@Dal.ca

Funders and Support: This study is funded by the Social Science and Humanities Research Council of Canada (SSHRC). This study is supported by Sport Nova Scotia and the Department of Health and Wellness.

INTRODUCTION and PURPOSE

Your child is invited to take part in a research study that aims to understand motivation for sport. Specifically, why some youth stay engaged in sport, and others drop out. The study asks your child to answer a number of questions related to his/her social experiences in sport, including questions related to him/her compare with others. With this study we hope to better explain why some athletes stay in sport and other do not.

Any youth can participate, as long as they can read English, are between 13 and 16 years of age, and currently participate in sport. Shea Balish, a doctoral student at Dalhousie University, is coordinating this research. Taking part in this study is completely voluntary and your child may choose to stop at any time without penalty.

The study is described below. This description tells you about both the benefits and the risks. You should discuss any questions you have about this study with Shea Balish (Shea.Balish@dal.ca - 902-266-3674).

STUDY DESIGN (What you will be asked to do)

First, your child will be asked if they would like to participate in the study (to assent). Next, your child will be asked to complete a questionnaire twice—once near the beginning of his/her athletic season, and once again near the end. The questionnaire includes questions relating to (1) your child's demographics (e.g., age, height, and gender), (2) history of sport participation, and (3) social experiences in sport, such as his/her perceptions of how teammates may support or punish him/her.

Please note that this survey will only commence once at least 80% of your child's teammates are given consent to participate in this study. This is because your child will be asked to rank his/her teammates on their level of talent and friendliness. However, your child will not be asked any questions regarding teammates who are not given consent to participate. Children will be asked that they do not share their answers to any questions, especially those regarding teammates.

The questionnaire your child will be asked to complete will take approximately 25 - 35 minutes to complete. Your child can complete the survey online (on the internet) or on paper. If your child has any problems or questions, simply contact the coordinator Shea Balish (Email: Shea.Balish@dal.ca, Phone: 902-266-3674) and he will assist you in

accessing the questionnaire. Participation is completely voluntary and your child may refuse to participate in any component of the research study, at any time.

POSSIBLE HARMS

Participating in this study will involve your child answering questions about his/her personal social experiences in sport, including his/her past behavior in sport. This may make your child feel uncomfortable. For example, your child will be asked to reflect on your teammates skill level and how they would help him/her if he/she made a mistake. Teammates will answer the same questions about your child. Although your child's teammates and your child will be asked to keep their answers to the survey private, we cannot guarantee that information regarding how others view your child, or how your child views them, will not be shared among the team by the participants themselves.

POSSIBLE BENEFITS

All participants will be eligible for a prize draw for a new Apple IPad Mini (retail value ~ $ 419), for each of the two surveys. In other words, if your child agrees to take both the first and second surveys, they will be entered into two separate prize draws, each for an Apple IPad Mini. Participants do not need to complete the entire survey to qualify for the prize draw. Beyond this prize draw, this survey completion may allow the researchers to better understand what aspects of sport best motivate youth to remain engaged in sport.

CONFIDENTIALITY

Your child does not need to provide his/her name on the questionnaire, only on the assent form. Each questionnaire will have a personalized code (last two letters of your participating child's first name, his/her day of birth, and the first letter of your child's last name); this is for the sole purpose of linking the two questionnaires. Although each questionnaire will have members of your child's team/club, including your child's name, others will not be able to link your child to his/her responses on the questionnaire. All data that your child provides will be made anonymous (i.e., unknown to other people) and will be kept in a secure computer file at Dalhousie University. No one other than the researchers will have access to your child's responses. Once data collection and data analysis from the project has been completed, your child's personal code will be destroyed. All computer files of the data will be stored on a password-protected computer in Shea Balish's locked office at Dalhousie.

WITHDRAWAL FROM THE STUDY

Participation in this research is completely voluntary and you may withdraw your child, or your child may withdraw, from the study at any time. In addition, your child may leave any questions in the survey unanswered. You may also withdraw your child's data. However, once all data is collected it will not be possible to withdraw your data as the researchers will have deleted any information that links participants names to their responses.

DEBRIEFING

If you wish to receive a summary of the results after the study has been completed, please provide your email address at the end of this informed consent (on the next page). This email address will only be used to email or mail you a short (300 words) summary of the

results and will be destroyed (i.e., deleted) once this summary has been sent to you.

QUESTIONS OR PROBLEMS

Please feel free to ask the researchers about the nature of this study. We will accept all collect calls.

Project Coordinator: Shea Balish **Email:** Shea.Balish@dal.ca, **Phone:** 902-266-3674

Primary investigator: Dr. Chris Blanchard Phone: 902-473-3789, **Email**: Chris. Blanchard@Dal.ca

Or, in the event that you have any difficulties with, or wish to voice concern about, any aspect of your child's participation in this study, you may contact Catherine Connors, Director of Dalhousie University's Office of Human Research Ethics Administration Phone: 494-1462 E-mail: Catherine.Connors@dal.ca

I have read the above information describing the research study, and I consent to my child's participation in it. I understand my child's participation is voluntary, and I may withdraw my child, or my child may withdraw from the study at any time for any reason. My signature below shows that I provide consent for my child to be contacted and to take part in this study. I understand that I have not waived any rights to legal recourse in the event of research-related harm.

Child's name	Date
Parent/Guardian Name (please print)	Signature

In the space below please provide the email address (e.g., child's email address) that the link to the child's survey can be sent to:

Email Address for Survey:_____

If you are interested in receiving the results once it has been completed, please provide your email address below.

By giving my email address, I understand my email address will only be used for the results of the study and will not be connected to the information I provide in the questionnaire and will be deleted after the results are provided.

Email Address:_____

Thank you for completing this consent form.

Appendix C Survey

Your Experience in Sport

Please pick your age from the drop-down menu.

- ○ 11
- ○ 12
- ○ 13
- ○ 14
- ○ 15
- ○ 16
- ○ 17
- ○ 18

Please report your birthdate (day /month / year).
For example, 1st April 1987.

Please list the area code of your home residence. For example, B3L2W6.

Please choose your most favourite sport:

My Favourite Sport

- ○ Aerobics
- ○ Archery
- ○ Baseball
- ○ Baton Twirling
- ○ Basketball
- ○ Bicycling
- ○ Bowling
- ○ Cheerleading
- ○ Climbing
- ○ Cricket

... 23 additional choices hidden ...

- ○ Squash
- ○ Surfing
- ○ Swimming
- ○ Tennis
- ○ Track and Field
- ○ Volleyball
- ○ Ultimate Frisbee
- ○ Water Skiing
- ○ Weight Training
- ○ Wrestling (competitive)

How many years have you played this sport?
Please choose from the dropdown box:

- ○ 0

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ 8
- ○ 9
- ○ 10
- ○ 11
- ○ 12
- ○ 13
- ○ 14
- ○ 15
- ○ 16
- ○ 17
- ○ 18

Please check the box which best represents your ethnicity:

- ○ Caucasian (non-hispanic white)
- ○ Black (e.g., African, Haitian, Jamaican, Somali)
- ○ Asian (e.g., Chinese, Japanese, Korean)
- ○ Indigenous Peoples (e.g., Inuit, North American Indian)
- ○ Arab/West Asian (e.g., Egyptian, Iranian, Lebanese)
- ○ Other

Biologically, I consider myself:

- ○ Male
- ○ Female
- ○ Intersex

Socially, I identify as:

- ○ Male
- ○ Female
- ○ Transsexual

Please list how tall you are. For example "5 foot 10 inches"

[ ]

Please pick your weight (in pounds) from the drop-down menu

- ○ 40
- ○ 41
- ○ 42
- ○ 43
- ○ 44

- ○ 45
- ○ 46
- ○ 47
- ○ 48
- ○ 49

... 240 additional choices hidden

...

- ○ 291
- ○ 292
- ○ 293
- ○ 294
- ○ 295
- ○ 296
- ○ 297
- ○ 298
- ○ 299
- ○ 300

For each sport that you regularly participated in (more than once per week, for more than two weeks)currently or throughout the last year, please pick if you played recreationally or competitively from the drop-down menu.
If you did not regularly participate in that specifc sport, leave the question blank for that sport (do not pick from the drop down menu).

Aerobics	○ I played this sport recreationally (for fun). ○ I played this sport competitively.
Archery	○ I played this sport recreationally (for fun). ○ I played this sport competitively.
Baseball	○ I played this sport recreationally (for fun). ○ I played this sport competitively.
Baton Twirling	○ I played this sport recreationally (for fun). ○ I played this sport competitively.
Basketball	○ I played this sport recreationally (for fun). ○ I played this sport competitively.
Bicycling	○ I played this sport recreationally (for fun). ○ I played this sport competitively.
Bowling	○ I played this sport recreationally (for fun). ○ I played this sport competitively.
Cheerleading	○ I played this sport recreationally (for fun). ○ I played this sport competitively.
Climbing	○ I played this sport recreationally (for fun). ○ I played this sport competitively.
Cricket	○ I played this sport recreationally (for fun). ○ I played this sport competitively.
Cross country	○ I played this sport recreationally (for fun). ○ I played this sport competitively.
Cross fit	○ I played this sport recreationally (for fun). ○ I played this sport competitively.

Dance (any type)	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Fencing	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Figure Skating	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Football	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Gymnastics	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Golf	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Hand ball	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Hockey	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Ice Skating	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Lacrosse	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Martial Arts (e.g., Karate, Judo)	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
MMA (Mixed Martial Arts)	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Mountain biking	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Paint ball	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Pool (Billards)	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Raquel Ball	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Roller Skating	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Running for Exercise	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Snow Skiing	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Snow Boarding	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Soccer	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Softball	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Squash	○	I played this sport recreationally (for fun).
	○	I played this sport competitively.
Surfing	○	I played this sport recreationally (for fun).

	○ I played this sport competitively.
Swimming	○ I played this sport recreationally (for fun).
	○ I played this sport competitively.
Tennis	○ I played this sport recreationally (for fun).
	○ I played this sport competitively.
Track and Field	○ I played this sport recreationally (for fun).
	○ I played this sport competitively.
Volleyball	○ I played this sport recreationally (for fun).
	○ I played this sport competitively.
Ultimate Frisbee	○ I played this sport recreationally (for fun).
	○ I played this sport competitively.
Water Skiing	○ I played this sport recreationally (for fun).
	○ I played this sport competitively.
Weight Training	○ I played this sport recreationally (for fun).
	○ I played this sport competitively.
Wrestling (competitive)	○ I played this sport recreationally (for fun).
	○ I played this sport competitively.

List of Best FriendsIn the space below, using their first name, please list up to ten of your closest friends in life (from school and from your neighbourhood).
You only need to use their first name. These friends do not necessarily have to play sport.

1st best Friend	
2nd best friend	
3rd best friend	
4th best friend	
5th best friend	
6th best friend	
7th best friend	
8th best friend	
9th best friend	
10th best friend	

How Strong are Your Friendships?
For your friends that you listed, please allocate 100 points among them. Points indicate the closeness of your relationship with each friend. For example, if friend A has twice as many points as friend B, this indicates that you are twice as close to A as you are to B. Please ensure that the points in this column sum to100.

1st best Friend	

2nd best friend	
3rd best friend	
4th best friend	
5th best friend	
6th best friend	
7th best friend	
8th best friend	
9th best friend	
10th best friend	

Friends in Sport

For each friend, please describe if they currently play on the same team as you.

	Yes	No
1st best Friend	○	○
2nd best friend	○	○
3rd best friend	○	○
4th best friend	○	○
5th best friend	○	○
6th best friend	○	○
7th best friend	○	○
8th best friend	○	○
9th best friend	○	○
10th best friend	○	○

The following questions are designed to reflect how you feel about being a part of your team. Please indicate your agreement with each of statement by choosing from the drop down menu.

I have a lot in common with other members on this team.	○ **(1) Does not describe me at all!** ○ **(2) Describes me a little.** ○ **(3) Describes some of me.** ○ **(4) Neutral.** ○ **(5) Describes me quite a bit.** ○ **(6) Describes me very much!** ○ **(7) Describes me perfectly!**
I feel strong ties to other members of this team.	
I find it easy to form a bond with other members in this team.	
I feel a sense of being “connected” with other members in this team.	
I often think about the fact that I am a team member.	

Overall, being a member of this team has a lot to do with how I feel about myself.
In general, being a member of this team is an important part of my self-image.
The fact that I am a member of this team often enters my mind.
In general, I'm glad to be a member of this team.
I often regret that I am a member of this team.
I feel good about being a member of this team.
Generally, I feel good when I think about myself as a member of this team.

Using each drop-down menu, please indicate how much each statement represents you.

I play sport ...Because it is very interesting to learn how I can improve.

- ○ **(1) Does not describe me at all!**
- ○ **(2) Describes me a little.**
- ○ **(3) Describes some of me.**
- ○ **(4) Neutral.**
- ○ **(5) Describes me quite a bit.**
- ○ **(6) Describes me me very much!**
- ○ **(7) Describes me perfectly!**

I play sport ...For the fun I have while I am playing sport.
I play sport ...Because I find it fun to learn new skills.
I play sport ...Because playing sports is who I am as a person.
I play sport ...Because when I am playing sport, I am living a good life.
I play sport ...Because participating in sport is an integral part of my life.
I used to have good reasons for playing sports, but now I am don't know if I should continue playing.
I don't know anymore; I feel like I cannot be successful in this sport.
I'm unsure; I don't feel like like I should play sport.

If you wanted to, could you play this sport next year?

- ○ Yes
- ○ No

Your Future in Sport

Here are some statements relating to whether you intend to play your sport next season. When providing your answers, consider how you feel at the moment.

Remember, no one other than the researchers will see your answers, so please answer honestly.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I intend to drop out of this sport at the end of this season.	○	○	○	○	○
I plan to play this sport next season.	○	○	○	○	○
I am thinking of quitting my team.	○	○	○	○	○
I would like to play for my current coach next season.	○	○	○	○	○

How do you Feel when Playing on your Current Sport Team?
Below are a number of words and phrases that describe different feelings and emotions. Read each item and then indicate the extent to which you generally feel this way on your current sport team (i.e., how you feel on the average) using the dropdown box beside each question:

When I play on this team I feel ... Proud

- ○ Not at all
- ○ Not very much
- ○ Somewhat
- ○ Moderately
- ○ Extremely

When I play on this team I feel ... Strong
When I play on this team I feel ... Bold
When I play on this team I feel ... Daring
When I play on this team I feel ... Fearless
When I play on this team I feel ... Accomplished
When I play on this team I feel ... Confident
When I play on this team I feel ... Fulfilled
When I play on this team I feel ... Like I am achieving
When I play on this team I feel ... Like I have self-worth
When I play on this team I feel ... Productive
When I play on this team I feel ... Successful

How do you Feel when Playing on your Current Sport Team?
Read each statement carefully and choose the circle to the right of the item that indicates the frequency with which you find yourself feeling or experiencing that feeling on your current sport team.

I feel my teammates and coach see me as not good enough

- ○ Never.
- ○ Seldom.
- ○ Sometimes.
- ○ Often.
- ○ Almost always.

I think that my teammates and coach look down on me

I feel insecure about teammates and coaches opinions of me
Teammates see me as not measuring up to them
Teammates and coaches see me as small and insignificant
Teammates and coaches see me as somehow defective as a athlete
Teammates and coaches see me as unimportant compared to others
Teammates and coaches think there is something missing in me

How does your coach help you?

	1 Strongly Disagree	2	3	4 Neutral	5	6	7 Strongly Agree
On this team, I feel that my coach does not give me the playing time I deserve.	○	○	○	○	○	○	○
On this team, I feel my coach recognizes my ability.	○	○	○	○	○	○	○
On this team, my coach is not confident in my ability to do well.	○	○	○	○	○	○	○
On this team, my coach encourages me to take risks.	○	○	○	○	○	○	○
On this team, my coach listens to how I would like to do things.	○	○	○	○	○	○	○
On this team, my coach is limiting my potential to be a very good player.	○	○	○	○	○	○	○

Here are some statements about what your current team is like. Please read each one and circle the number that is most correct. If there was more than one coach on your team, the questions are about the coach that you spend most of your time with.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Winning games was the most important thing for the coach.	○	○	○	○	○
The coach made players feel good when they improved a skill.	○	○	○	○	○
The coach spent less time with the players who weren't as good.	○	○	○	○	○

The coach encouraged us to learn new skills.	○	○	○	○	○
The coach made it clear which players on the team were the best.	○	○	○	○	○
The coach told players to help each other get better.	○	○	○	○	○
The coach told us that trying our best was the most important thing.	○	○	○	○	○
The coach paid most attention to the best players.	○	○	○	○	○
Coach said that teammates should help each other improve their skills.	○	○	○	○	○
Players were taken out of games if they made a mistake.	○	○	○	○	○
The coach said that all of us were important to the team's success.	○	○	○	○	○
Coach told us to try to be better than our teammates.	○	○	○	○	○

Sport Motivation

These statements relate to your feelings and experiences on your team. Please click the circle that best reflects how you felt during this period.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I decided which activities I practiced.	○	○	○	○	○
I thought I was quite good at this sport.	○	○	○	○	○
I felt people supported me.	○	○	○	○	○
I had a say on what skills I worked on.	○	○	○	○	○
I was satisfied with what I did.	○	○	○	○	○
I felt people understood me.	○	○	○	○	○
It was my choice to play this sport.	○	○	○	○	○
I was skillful.	○	○	○	○	○
I felt people listened to my opinion.	○	○	○	○	○
I felt the freedom to do some things my own way.	○	○	○	○	○
I felt quite competent.	○	○	○	○	○

I felt people valued me.	○	○	○	○	○
I felt I performed very well.	○	○	○	○	○
I had some choice in what I did.	○	○	○	○	○
I think I did quite well.	○	○	○	○	○

Appendix D Letter of Ethical Approval

From: "sharon.gomes@dal.ca" <sharon.gomes@dal.ca>
Date: November 12, 2014 at 3:32:54 PM AST
To: "Dr Christopher Blanchard (Primary Investigator)" <ch401210@dal.ca>
Cc: "Mr Daniel Rainham (Co-Investigator)" <DRAINHAM@dal.ca>, "sharon.gomes@dal.ca" <sharon.gomes@dal.ca>
Subject: REB # 2014-3377 Letter of Approval

Social Sciences & Humanities Research Ethics Board
Letter of Approval November 12, 2014
Dr Christopher Blanchard
Medicine\Medicine\Cardiology

Dear Christopher,

REB #: 2014-3377
Project Title: An Initial Test of the Adaptive Regulation Theory of Motivation for Sport (ARMS)

Effective Date: November 12, 2014 **Expiry Date:** November 12, 2015
The Social Sciences & Humanities Research Ethics Board has reviewed your application for research involving humans and found the proposed research to be in accordance with the Tri-Council Policy Statement on *Ethical Conduct for Research Involving Humans.* This approval will be in effect for 12 months as indicated above. This approval is subject to the conditions listed below which constitute your on-going responsibilities with respect to the ethical conduct of this research.

Sincerely,

Dr. Valerie Trifts, Chair

Post REB Approval: On-going Responsibilities of Researchers
After receiving ethical approval for the conduct of research involving humans, there are several ongoing responsibilities that researchers must meet to remain in compliance with University and Tri-Council policies.

1. Additional Research Ethics approval
Prior to conducting any research, researchers must ensure that all required research ethics approvals are secured (in addition to this one). This includes, but is not limited to,

securing appropriate research ethics approvals from: other institutions with whom the PI is affiliated; the research institutions of research team members; the institution at which participants may be recruited or from which data may be collected; organizations or groups (e.g. school boards, Aboriginal communities, correctional services, long-term care facilities, service agencies and community groups) and from any other responsible review body or bodies at the research site

2. Reporting adverse events
Any significant adverse events experienced by research participants must be reported **in writing** to Research Ethics **within 24 hours** of their occurrence. Examples of what might be considered "significant" include: an emotional breakdown of a participant during an interview, a negative physical reaction by a participant (e.g. fainting, nausea, unexpected pain, allergic reaction), report by a participant of some sort of negative repercussion from their participation (e.g. reaction of spouse or employer) or complaint by a participant with respect to their participation. The above list is indicative but not all-inclusive. The written report must include details of the adverse event and actions taken by the researcher in response to the incident.

3. Seeking approval for protocol / consent form changes
Prior to implementing any changes to your research plan, whether to the protocol or consent form, researchers must submit them to the Research Ethics Board for review and approval. This is done by completing a Request for Ethics Approval of Amendment to an Approved Project form (available on the website) and submitting three copies of the form and any documents related to the change. Please note that no reviews are conducted in August.

4. Submitting annual reports
Ethics approvals are valid for up to 12 months. Prior to the end of the project's approval deadline, the researcher must complete an Annual Report (available on the website) and return it to Research Ethics for review and approval before the approval end date in order to prevent a lapse of ethics approval for the research. Researchers should note that no research involving humans may be conducted in the absence of a valid ethical approval and that allowing REB approval to lapse is a violation of University policy, inconsistent with the TCPS (article 6.14) and may result in suspension of research and research funding, as required by the funding agency. 5. Submitting final reports
When the researcher is confident that no further data collection or analysis will be required, a Final Report (available on the website) must be submitted to Research Ethics. This often happens at the time when a manuscript is submitted for publication or a thesis is submitted for defence. After review and approval of the Final Report, the Research Ethics file will be closed.

6. Retaining records in a secure manner Researchers must ensure that both during and after the research project, data is securely retained and/or disposed of in such a manner as to comply with confidentiality provisions specified in the protocol and consent forms. This may involve destruction of the data, or continued arrangements for secure storage. Casual storage of old data is not acceptable.

It is the Principal Investigator's responsibility to keep a copy of the REB approval letters. This can be important to demonstrate that research was undertaken with Board approval, which can be a requirement to publish (and is required by the Faculty of Graduate Studies if you are using this research for your thesis).

Please note that the University will securely store your REB project file for 5 years after the study closure date at which point the file records may be permanently destroyed.

7. Current contact information and university affiliation The Principal Investigator must inform the Research Ethics office of any changes to contact information for the PI (and supervisor, if appropriate), especially the electronic mail address, for the duration of the REB approval. The PI must inform Research Ethics if there is a termination or interruption of his or her affiliation with Dalhousie University.

8. Legal Counsel The Principal Investigator agrees to comply with all legislative and regulatory requirements that apply to the project. The Principal Investigator agrees to notify the University Legal Counsel office in the event that he or she receives a notice of non-compliance, complaint or other proceeding relating to such requirements. 9. Supervision of students Faculty must ensure that students conducting research under their supervision are aware of their responsibilities as described above, and have adequate support to conduct their research in a safe and ethical manner.

Appendix E Annual Ethical Review Approval

From: <sharon.gomes@dal.ca>
Date: November 2, 2015 at 3:09:00 PM AST
To: "Dr Christopher Blanchard (Primary Investigator)" <ch401210@dal.ca>
Cc: "Mr Daniel Rainham (Co-Investigator)" <DRAINHAM@dal.ca>, <sharon.gomes@dal.ca>
Subject: REB # 2014-3377 Annual Renewal - Approval

Social Sciences & Humanities Research Ethics Board
Annual Renewal - Letter of Approval November 02, 2015
Dr Christopher Blanchard
Medicine\Medicine\Cardiology

Dear Christopher,
REB #: 2014-3377
Project Title: An Initial Test of the Adaptive Regulation Theory of Motivation for Sport (ARMS)

Expiry Date: November 12, 2016
The Social Sciences & Humanities Research Ethics Board has reviewed your annual report and has approved continuing approval of this project up to the expiry date (above).

REB approval is only effective for up to 12 months (as per TCPS article 6.14) after which the research requires additional review and approval for a subsequent period of up to 12 months. Prior to the expiry of this approval, you are responsible for submitting an annual report to further renew REB approval. Forms are available on the Research Ethics website.

I am also including a reminder (below) of your other on-going research ethics responsibilities with respect to this research.

Sincerely,

Dr. Karen Beazley, Chair

Post REB Approval: On-going Responsibilities of Researchers
After receiving ethical approval for the conduct of research involving humans, there are several ongoing responsibilities that researchers must meet to remain in compliance with University and Tri-Council policies.

1. Reporting adverse events

Any significant adverse events experienced by research participants must be reported **in writing** to Research Ethics within **24 hours** of their occurrence. Examples of what might be considered "significant" include: an emotional breakdown of a particpant during and interview, a negative physical reaction by a participant (e.g. fainting, nausea, unexpected pain, allergic reaction), report by a participant of some sort of negative repercussion from their participation (e.g. reaction of spouse or employer) or a complaint by a participant with respect to their participation. The above list is indicative but not all-inclusive. The written report must include details of the adverse event and actions taken by the researcher in response to the incident.

2. Seeking approval for protocol / consent form changes Prior to implementing any changes to your research plan, whether to the study design, methods, consent form, or study instruments, researchers must submit a description of proposed changes to the Research Ethics Board for review and approval. This is done by completing an Amendment Request (available on the Research Ethics website). Please note that no reviews are conducted in August.

3. Submitting annual reports

Ethics approvals are valid for up to 12 months. Prior to the end of the project's approval deadline, the researcher must complete an Annual Report (available on the website) and return it to Research Ethics for review and approval before the approval end date in order to prevent a lapse of ethics approval for the research. Researchers should note that no research involving humans may be conducted in the absence of a valid ethical approval and that allowing REB approval to lapse is a violation of University policy, inconsistent with the TCPS (article 6.14) and may result in suspension of research and research funding, as required by the funding agency.

4. Submitting final reports

When the researcher is confident that no further data collection or participant contact will be required, a Final Report (available on the website) must be submitted to Research Ethics. After review and approval of the Final Report, the Research Ethics file will be closed.

5. Retaining records in a secure manner Researchers must ensure that both during and after the research project, data is securely retained and/or disposed of in such a manner as to comply with confidentiality provisions specified in the protocol and consent forms. This may involve destruction of the data, or continued arrangements for secure storage. Casual storage of old data is not acceptable.

It is the Principal Investigator's responsibility to keep a copy of the REB approval letters. This can be important to demonstrate that research was undertaken with Board approval, which can be a requirement to publish (and is required by the Faculty of Graduate Studies if you are using this research for your thesis).

Please note that the University will securely store your REB project file for 5 years after the study closure date at which point the file records may be permanently destroyed.

6. Current contact information and university affiliation The Principal Investigator must inform the Research Ethics office of any changes to contact information for the PI (and supervisor, if appropriate), especially the electronic mail address, for the duration of the REB approval. The PI must inform Research Ethics if there is a termination or interruption of his or her affiliation with Dalhousie University.

7. Legal Counsel The Principal Investigator agrees to comply with all legislative and regulatory requirements that apply to the project. The Principal Investigator agrees to notify the University Legal Counsel office in the event that he or she receives a notice of non-compliance, complaint or other proceeding relating to such requirements. 8. Supervision of students Faculty must ensure that students conducting research under their supervision are aware of their responsibilities as described above, and have adequate support to conduct their research in a safe and ethical manner.

Appendix F Email Recruitment Script to Parents

Dear XXXXXXXXX,

My name is Shea Balish. I'm a research coordinator at Dalhousie University conducting a study on motivation for sport. I'm emailing to offer you the opportunity for your child to participate in this study. The study involves your child completing two surveys; one at the beginning of an athletic season and one near the end.

If you click the digital link below, you will be taken to the description of the study and will have the opportunity to allow your child to participate. If your child agrees to take the survey, they will be entered into a prize draw to win an Apple IPad mini.

Your child's answers are completely confidential and will not be linked to his/her personal information. Please note that this study is completely voluntary and that your child may stop answering the survey at any time without any repercussions.

If you have any questions, please feel free to contact me via email (Shea.Balish@dal.ca) or by phone (902-266-3674).

LINK TO STUDY: ---------[digital link]----------

Thanks

Shea M. Balish

Research Coordinator – ARMS Project
Dalhousie University, HGL Lab 1365 Oxford Street
Life Science Building, Room 827
B3H4R2, Halifax, NS
Cell: (902) 266 3674
Email: Shea.Balish@Dal.ca
Skype: balish1987

Appendix G Coach Recruitment Transcript

My name is Shea Balish. I'm a research coordinator at Dalhousie University conducting a study on motivation for sport.

I'm emailing to offer you the opportunity for your team to participate in this study. The study involves your team members completing two surveys; one at the beginning of an athletic season and one near the end.

The digital link below can be sent to parents, which will take them to the description of the study and will give them the opportunity to allow their child to participate. If your team members and their parents agree to take the survey, they will be entered into a prize draw to win an Apple IPad mini.

The team members answers are completely confidential and will not be linked to their personal information. Please note that this study is completely voluntary and that a child or parent may stop answering the survey at any time without any repercussions.

If you have any questions, please feel free to contact me via email (Shea.Balish@dal.ca) or by phone (902-266-3674).

LINK TO STUDY: ---------[digital link]----------

Thanks

Shea M. Balish

Research Coordinator – ARMS Project
Dalhousie University, HGL Lab 1365 Oxford Street
Life Science Building, Room 827
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Appendix H Parent Notification Email Script

Dear Parent/Guardian,

Several months ago you consented your child to participate in a research project on motivation for sport. This project involves answering two surveys, one of which your child has already completed.

This is a follow-up email to inform you that the second survey has been emailed to your child and is now ready to be completed.

Recall that you or your child may withdraw from the study at anytime without consequence. By simply clicking on the link to the second survey and providing his/her personal code, your child will be entered to win an Apple Ipad mini. Your child will remain in the prize draw even if he/she doesn't finish the survey.

A link to the original consent form can be found here: XXXXXXXXXXXXX

Please feel free to contact me if you have any questions or concerns:

Project Coordinator: Shea Balish **Email**: Shea.Balish@dal.ca, **Phone**: 902-266-3674

Thanks

Shea

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Shea M. Balish
Research Coordinator
ARMS Sport Motivation Project

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