Abstract

According to the 2008 Statistics Canada report on the extracurricular activities of Canadian children and youth, approximate 76% of Canadians under the age of 17 participate in sport. As such, sport represents a significant developmental experience in many young peoples’ lives. Whether this experience is positive or negative depends on a number of factors related to the specific context in which sport participation occurs. In particular, interpersonal interactions are known to be a significant influence on athlete development and may vary greatly across sport contexts. In youth sport, there are two primary contexts of participation: coach-driven organized sport and youth-driven informal sport play. The purpose of the present program of research was to examine the predominant interpersonal interactions occurring in organized sport and informal sport play contexts and their relationship to athlete development.

Study 1 was methodological and presents the development and validation of an observational coding system designed to capture the motivational tone of youth sport coaches’ interactions with their athletes. Motivational tone represents a theoretically relevant but previously unexplored dimension of coaches’ interactive behaviour.

Study 2 used the newly developed coding system from study 1 to examine the motivational tone of coach-athlete interactions in competitive youth volleyball, an organized sport context. Using a person-centred analysis approach, these coach-athlete interaction were then linked to athletes’ longitudinal development trajectories over the course of the competitive season. Results revealed significant differences in the coach-athlete interaction profiles of athletes on a negative developmental trajectory compared to athletes on a positive developmental trajectory.
Study 3 was an exploratory observational examination of peer interactive behaviour in an informal sport play context. These interactive behaviours were examined with respect to athletes’ developmental outcomes. Results pointed to the social nature of participation in informal sport play contexts and the critical relationship between athlete competence and peer interaction tendencies.

Overall, the results of the three studies comprising this program of research offered new information to further our understanding of interpersonal interactions and athlete development in different youth sport contexts but also identified several avenues requiring further research.
Co-Authorship Statement

As dissertation supervisor, Dr. Jean Côté is co-author on all three manuscripts contained within this dissertation (Chapters 3-5). On all three manuscripts, Karl Erickson had primary responsibility for conception and study design, data collection, analysis and interpretation of data, and the drafting and revision of the manuscript documents.
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CHAPTER 1 - General Introduction

According to the 2008 Statistics Canada report on the extracurricular activities of Canadian children and youth, approximately 76% of Canadians under the age of 17 participate in sport. With such a large proportion of young people engaging in this experience, it behooves us as researchers and as a society to better understand the nature and implications of this participation. More specifically, how does participation in sport contribute to psychosocial development for youth? How can this contribution be optimized toward positive youth development?

In recent decades, researchers in developmental psychology have begun to examine the psychosocial development of youth from a positive or asset-promoting perspective (Benson, 1997; Damon, 2004; Dworkin, Larson, & Hanson, 2003; Lerner, 2002) rather than a deficit reduction approach. Research conducted from this perspective endeavours to understand the nature of developmental processes that facilitate human development and the factors that influence these processes towards adaptive ends. Further, the contextualized nature of developmental processes (Lerner, 2002) suggests that research addressing positive youth development must necessarily consider the real-world contexts in which this development is occurring. Given the predominance of sport as an extracurricular and recreational activity for youth (Statistics Canada, 2008) and the considerable amount of time youth spend in sport relative to other organized activities (Eccles & Barber, 1999; Larson & Verma, 1999), sport would appear to be a significant developmental context. Fraser-Thomas, Côté, and Deakin (2005) highlighted the potential role youth sport can play in the promotion of overall positive youth development; however, they also noted that youth sport is far from a homogenous activity – differences in specific sport contexts can significantly influence whether youth experience
positive or negative development as a result of their participation. In particular, these authors argued that the primary determinants of youth development in specific sport contexts are the predominant social actors (i.e., coaches and peers).

Thus, in order to better understand the influence of sport participation on youth development, we must examine this participation with respect to both the context in which it takes place and the primary interpersonal interactions occurring within it. The objective of this line of research was therefore to develop a clearer picture of the predominant interpersonal interactions occurring in different youth sport contexts and to further our knowledge of the context-specific relationships between interpersonal interactions and positive youth development.
CHAPTER 2 – Literature Review

Contexts of Athlete Development

Athlete development, conceptualized here as encompassing both sport talent and psychosocial domains, does not occur as a single instance; it is a process taking place over time and in multiple settings. The developmental model of sport participation (DMSP: Côté, 1999, Côté, Baker, & Abernethy, 2007), one of the most prominent models of holistic athlete development (Bruner, Erickson, Wilson, & Côté, 2010), proposes that athletes progress through a series of qualitatively different stages within one of three pathways over the course of their sport involvement. Based on retrospective studies of elite athletes’ development and qualitative studies of developing athletes, the three pathways are: a) recreational participation through sampling, b) elite performance through sampling, and c) elite performance through early specialization. Each of these pathways and the stages within them are differentiated by changes in the type and amount of sport activities in which athletes are involved.

In particular, the DMSP distinguishes between two types of sport activities – deliberate play and deliberate practice. Deliberate play (Côté, 1999) sporting activities such as street hockey or pick-up basketball are designed purely for enjoyment rather than for skill development and often involve modifications of rules to meet the needs of participants. Deliberate play activities are informal, youth-driven, and relatively free of adult organization and direction. In contrast, deliberate practice (Ericsson, Krampe, & Tesch-Römer, 1993) activities, typical of more organized sport, are explicitly designed to improve performance and are often directed and monitored by a coach.

The DMSP suggests that both the elite performance and recreational participation through sampling pathways share a common foundation and are posited to produce positive
athlete development (Côté, Lidor, & Hackfort, 2009). The sampling years (ages 6-12), as this common foundation is known, are characterized by participation in a variety of sports with a heavy emphasis on deliberate play as the primary type of sport activity. After the sampling years, athletes choose to either pursue elite performance through the specializing (ages 13-15) and investment years (ages 16+), which are characterized by an increasing focus on deliberate practice activities, or remain involved in sport at a recreational level with more play-type activities. The elite performance through early specialization pathway, with its unvarying focus on a single sport and characterized by high amounts of deliberate practice beginning at initial entry into sport, is explicitly focused on the development of sport talent and has been associated with a number of negative developmental outcomes (e.g., reduced enjoyment, burnout, dropout, and injuries; Fraser-Thomas, Côté, & Deakin, 2008; Gould, Tuffey, Udry, & Loehr, 1996; Wall & Côté, 2007). Thus, the environment of each stage is defined by the type and nature of the sport activities they entail, and might be reduced to two primary contexts: coach-driven organized sport and youth-driven informal sport play.

**Conceptualizations of Athlete Development**

Athlete development has traditionally been conceptualized as the development of sport talent. While this view represents an important consideration given the time, effort, and resources required to produce elite performance, recent recognition of the wider developmental (i.e., psychosocial) implications of sport participation for young people has garnered international attention (Côté & Fraser-Thomas, 2011; UNESCO, 1999). Providing a backdrop for this shift in understanding of the purposes and outcomes of youth sport participation, researchers of youth and adolescent development have compiled a growing body of work addressing the conditions and factors that contribute toward positive or adaptive psychosocial development trajectories for
young people (e.g., Larson, 2000; Lerner, 2002). This literature highlights that in order to optimally develop youths’ capacity to thrive as positively engaged and contributing members of society, a number of experiential themes consistently emerge. First, youth require opportunities to both develop and demonstrate meaningful skills and abilities. Inherent to this process is the necessary support for learning and skill development, as well as encouragement for youth to autonomously express those skills in meaningful ways. Second, youth must learn to consider their actions as situated within the larger, interconnected social sphere. This consideration requires developing awareness of the ethical implications of their own and others actions. Finally, meaningful relationships with others provide the foundation for both functional and ethical development, in addition to providing an independent marker of positive personal and social development. A significant contribution of this work is the acknowledgement that human development does not occur in a vacuum, that a full understanding of these processes (and the hopefully resulting increased facilitation of overall positive psychosocial development for youth) requires examination of real-world developmental contexts and youths’ experiences in these contexts. In order to optimize the potential contribution of a given developmental environment (i.e., youth sport), we must combine our knowledge of the workings of that environment (i.e., sport research) with a comprehensive understanding of the range of personal and interpersonal processes (i.e., youth development research) that may be influenced by participation in that environment. The combination of sport talent development and general positive youth development perspectives has thus set the stage for a broadened conceptualization of athlete development.

In this vein, recent work in sport drawing from the positive youth development literature has promoted a more holistic view of athlete development, concerned with aspects of the athlete
as a person beyond simply their sport skill and ability (Holt, 2008). One framework developed to encompass this broader conceptualization within the general youth development domain is the 5C’s (Lerner, 2004; Lerner et al, 2005; Roth & Brooks-Gunn, 2003), representing competence, confidence, connection, character, and caring/compassion. This framework has been used extensively in positive youth development research, including large-scale longitudinal studies, and has proven capable of capturing differential youth development trajectories over several years (see Lerner, von Eye, Lerner, Lewis-Bizan, & Bowers, 2010).

In adapting this framework to sport research, Côté and colleagues (Côté, Bruner, Erickson, Strachan, Fraser-Thomas, 2010; Côté & Gilbert, 2009) collapsed the caring/compassion dimension of the original C’s with the character dimension to better reflect the overlapping conceptualization of these constructs within the sport psychology literature. The resulting 4C’s used to conceptualize athlete development in the present line of research are competence, confidence, connection, and character. Competence from this perspective is defined as one’s proficiency at performing within a specific domain, in this case playing a sport. This quality would include typical notions of sport talent or ability. Confidence reflects an individual’s general perceptions of self-worth and efficacy within the sport domain. It is a general quality in the sense that it is not referenced to specific actions at a specific time and place (i.e., playing well in a particular game against a particular opponent). Connection refers to positive bonds with other people in the sport context in which both parties contribute to the relationship. Finally, character refers to both moral or ethical development and empathic understanding of others; that is, an individual’s sense of right and wrong for both their own actions and in regards to other people in sport. The combination of all 4C’s is intended to encompass the full spectrum of positive developmental outcomes associated with sport.
participation and represent the desired products of holistic athlete development. In addition to the original theoretical work (Côté et al, 2010), the 4C’s structure has been further validated in sport through qualitative interviews with youth sport coaches (Vella, Oades, & Crowe, 2011) and the compilation of a coherent measurement framework (Vierimaa, Erickson, Côté, & Gilbert, 2012). While an initial study of the psychometric properties of the original 5C’s model in sport (Jones, Dunn, Holt, Sullivan, & Bloom, 2011) failed to find support for a five factor model, the items used were taken from the original non-sport measurement battery and may not have adequately captured the unique qualities of sport participation contexts (e.g., competence conceptualized as academic achievement rather than sport skill). Vierimaa and colleagues (2012) argued that the measurement of positive youth development in sport needs to be tailored specifically to the sport context and, accordingly, the measurement framework used for the present program of research consists of questionnaires and assessment strategies designed and previously validated within youth sport contexts.

**Interpersonal Interactions**

In considering the developmental process, a number of general theories (e.g., relational developmental systems theory – Lerner, 2006; the bioecological model of development – Bronfenbrenner, 1977; 1979) highlight that human development is the product of the complex, reciprocal interactions between the developing individual and his/her environment over time. According to these theories, the other social actors present within an environment are key features of any developmental contexts. Thus, interpersonal interactions between individuals and the significant others in the developmental contexts in which they participate are primary drivers of individuals’ development. Further, different interpersonal interaction patterns might therefore offer different stimuli for development and influence the direction of individuals’ developmental
trajectories over time. It is exactly this premise that Goodnow (2001) emphasized in her work on differentiating contexts of development. In particular, she highlights the kinds of interactions and degree of social participation occurring within a given setting as critical differentiators between development contexts.

In the organized sport context, it has been argued that the dominant interpersonal interactions occur between athletes and the coach (Fraser-Thomas, Côté, & Deakin, 2005). A substantial body of research exists outlining the significant influence that coaches have on athlete development (see Horn, 2008). Utilizing a number of different methodological approaches, including direct observation of coaches’ behaviour (e.g., Smith & Smoll, 2007), questionnaires targeting relative perceptions of coaches’ behaviour (e.g., Ntoumanis, 2012; Roberts, 2012), and qualitative examinations of the meaning behind these behaviours (e.g., Keegan, Harwood, Spray, & Lavallee, 2009), this body of literature collectively demonstrates that coaches are a key shaper of youths’ sport experiences and development through their interactive behaviour.

In perhaps the most notable line of research on youth sport coaching behaviour, Smith, Smoll, and colleagues (Curtis, Smith, & Smoll, 1979; Smith & Smoll, 1990; Smoll, Smith, Curtis, & Hunt, 1978; Smith, Zane, Smoll, & Coppel, 1983) made use of observational techniques to elucidate the relationship between specific coaching behaviours and positive youth sport experiences. To observe coaching behaviour, Smith, Smoll, and colleagues developed the now widely used Coaching Behavior Assessment System (CBAS; Smith, Smoll, & Hunt, 1977a). A systematic observation instrument, the CBAS consists of 12 coach behaviour categories (eight in response to athlete behaviour, four initiated by the coach not in response to immediately preceding athlete behaviour) developed through detailed content analysis of coaches in a number of youth sports. The program of research coded coaching behaviours recorded using the CBAS
and generated behavioural profiles for youth sport coaches by calculating the relative frequency of expression of each of the behavioural categories. This was paired with administration of interviews and questionnaires to youth regarding their perceptions of their coach, their sport experience, and themselves. In general, Smith, Smoll, and colleagues concluded that youth sport coaches who exhibited high levels of supportive and instructional behaviours were rated most positively by their athletes. They also noted that athletes of coaches who demonstrated more supportive and instructive behaviours reported having more fun and liking their teammates more than athletes of coaches who were more punitive in their interactions.

Based on results from these descriptive and correlative studies, Smith, Smoll and colleagues developed the Coach Effectiveness Training program (CET: Smith & Smoll, 1997; Smith & Smoll, 2002; Smith, Smoll, & Curtis, 1979) to educate coaches to better promote positive psychosocial outcomes in the athletes they coach. By training coaches to be more supportive, instructive, and less punitive in a number of controlled intervention studies (Barnett, Smoll, & Smith, 1992; Smith & Smoll, 1997; Smith, Smoll, & Barnett, 1995; Smoll, Smith, Barnett, & Everett, 1993; Smith et al, 1979), these authors were able to alter coaches’ actual behaviour and produce a number of positive outcomes in athletes to a greater degree than with untrained coaches. They found that athletes with trained coaches had more fun, decreased performance anxiety, were less likely to drop out, and evaluated their coaches, teammates, and the sport more positively than athletes with untrained coaches. These results were found despite no differences in won/lost records between the trained and untrained coaches, suggesting a significant causal role was played by the CET program in producing these differential athlete outcomes. The influential line of research conducted by Smith, Smoll, and colleagues
demonstrates how coach behaviour can be both a determinant of athlete outcomes and a productive avenue for intervention and positive change.

Despite the valid formulation of empirically derived principles to guide coach training interventions, the supporting data has been presented in a relatively uncomplicated conceptualization of the coaching process, providing little information about the complexities of real-world usage of such behaviours. While CET has solid theoretical foundations for the recommended modes of translating this content into practice in actual coaching situations, there remains a dearth of empirical evidence related to these behavioural processes – how these behaviours should be enacted and adapted to meet the needs of all athletes in dynamic coaching situations.

In contrast to organized sport, the absence of coaches or other directing adults in informal sport play contexts means that the principle interpersonal interactions occur between peers. Connections with peers are a significant component of adolescent development; Rubin, Bukowski, and Parker (2006) highlight that these connections occur, and exert influence on development, at several different levels of complexity. More specifically, individual peer-to-peer interactions form the basis for the development of relationships as they settle into patterns over time. These individual relationships are then situated within the larger interconnected network of groups (e.g., teams). The quality and degree of connection at each different level can be expressed through a number of different indicators such as friendship, social acceptance, social roles, and group dynamics. These indicators of peer connection quality, though less researched than the role of coaches, are known to exert a strong influence on young athletes’ experiences in sport (Smith, 2003). However, when considered with Rubin and colleagues’ levels of complexity in mind, the vast majority of this research in sport has focused on either the
relationship or group level, with little attention to the in-the-moment interactive behaviours that create or are influenced by these higher order qualities. While there has been extensive previous research examining coach interactive behaviour (see Cushion, 2010; Kahan, 1999), relatively few studies have looked at peer interactive behaviour within sport (Bruner, Eys, & Turnnidge, 2013; Smith, 2003). Further, most research examining peers in sport has been conducted in organized sport contexts and none to our knowledge, particularly at the level of direct interactions, conducted in informal sport play contexts. Thus, while new research in coaching must look to probe the complex nuances of coach-athlete interactions in order to build upon the solid existing foundation, research on peer interactive behaviour in informal sport play contexts is at such a relatively under-developed stage that simply identifying how and why peers interact in these contexts is a necessary first step to understanding their influence on athlete development.

**Methodological Considerations**

Within this examination of athlete development, a focus on context has important methodological implications. Primarily, this focus necessitates examination of real-world sport settings, as experienced by participants in situ, in real time. In order to examine the nature and influence of particular sport contexts, we must situate our research within those contexts to have access to the unique person-context interactions driving athlete development (Lerner, 2006; Bronfenbrenner, 1977; 1979). As well, given the further focus on situated interpersonal interactions, the present research takes an observational approach. Systematic observation methodologies have a long and productive history in the study of coaches’ interactive behaviour (Kahan, 1999). However, this previous work has primarily targeted the pedagogical content of coaches’ behaviour and it has been argued that there is room and need for the study of more diverse qualities of coaches’ behaviour in order to better understand their influence on athlete
development (Cushion, 2010; Horn, 2008). With regard to peers, a relatively smaller but growing body of research has examined the social influence of peers in sport (Smith, 2007; Weiss & Stuntz, 2004). Within this work, direct observation of peer interactions has been under-utilized; subsequently, we know very little about the actual interactive behaviours of peers in sport (Murphy-Mills, Bruner, Erickson, & Côté, 2011). This lack of knowledge is particularly striking for informal sport play contexts.

Within coaching research, there is a distinct need for more complex examination and analysis of observed behaviour. Smith (2006) made a significant step in this regard through the re-analysis of older CBAS-derived data. By examining intra-individual variability in coaching behaviours in relation to game situation (i.e., winning, tied, losing), Smith was able to generate contextually linked behavioural signatures for individual coaches. These signatures represented the manner in which the frequency of specific coach behaviour occurrence changed over the course of a game. While this analysis provided valuable insight into the dynamic, shifting nature of coach behaviour and represents an important step forward conceptually, the data were presented in a primarily theoretical paper and were not linked to athlete outcomes, nor did the analysis take temporal sequencing into account. Smith and colleagues (Smith, Shoda, Cumming, & Smoll, 2009) later expanded on their earlier notion of situationally-linked behavioral signatures by examining the relationships between changes in coach behavior with respect to game situation (i.e., winning, tied, or losing) for coaches of 10- to 15-year-old baseball players and the athletes’ attitudes toward their coach. The authors found that although the overall rates of instructional, supportive, and punitive behaviors accounted for a small proportion of the variance in athletes’ liking for their coach, particular situation-behavior contingencies (i.e., if situation, then behavior) demonstrated much stronger relationships with attitude toward the coach.
Specifically, coaches who were highly supportive when winning and avoided punitive behaviors when losing, were rated much more positively than coaches who displayed the opposite pattern. In general, coaches who become more punitive when their team started losing were rated poorly, while supportiveness while winning was significantly related to higher liking scores. Emphasizing the importance of situational specificity, both these behavioral dimensions lost their predictive value in the opposite game situation (i.e., punishment while winning and supportiveness while losing). Analyzing coach behaviour with respect to situational signatures is an excellent example of incorporating more complex dimensions of behavioural expression, with significant implications for real-world coaching. However, much of this complexity still remains largely unexplored. For example, the contributions of athletes to coach-athlete interactions has not been fully accounted for and, in turn, how different athletes might shape these interactions differently is relatively unknown.

In response to similar methodological shortcomings, researchers in developmental psychology developed the state space grid (SSG: Hollenstein, 2007; Lewis, Lamey, & Douglas, 1999) observational method. Based on principles of dynamic systems, SSG’s are designed to account for both the reciprocal nature and time-course structure of interactions. Conceptualizing coach-athlete or peer-peer interactions as dynamic systems, SSG’s provide a graphical representation of the total state space (the range of interaction possibilities) for the system in question and of that system’s trajectory within it in real-time. This graphical representation then provides the basis for quantification of the systems’ functioning and subsequent analysis of its defining characteristics.

The total state space for SSG’s is a grid defined by the complete range of possible categories for each individual component of the system (for example, a coach and an athlete),
with the categories for one component (i.e., coach) making up the x-axis and the categories for the other component (i.e., athlete) making up the y-axis. Thus, each cell in the grid represents a pairing of a specific coach behaviour with a specific athlete behaviour – an x and y location coordinates. The functioning of the system is then located on the grid by coding which specific behaviours the coach and athlete are concurrently exhibiting at any given point in time (as a very general hypothetical example, the coach yelling while the athlete pouts). This corresponds to a specific cell within the state space grid. This is represented graphically by a point in that particular cell, with the diameter of the point corresponding to the duration that the system stays in that cell (e.g., coach keeps yelling and athlete keeps pouting). Since the location of the system is defined by both a coach and an athlete behaviour, the moment either the coach or the athlete (or both) change their behaviour (e.g., coach stops yelling to observe the athlete, athlete keeps pouting), the system has shifted to a new location. This new mutually-defined location corresponds to a different cell in the grid, with the system represented by a point in that cell, and a line is drawn connecting the two points in the two different cells. This process continues every time there is a change in either coach or athlete behaviour for the course of the observation.

Thus, the real-time trajectory of the system – the coach-athlete interaction– is mapped within the total possible state space as a series of dots (representing behaviour content and duration) connected in a sequential order. The trajectory can then be analyzed with regard to the areas of the grid within which it functions or to which it is ‘drawn’, how much of the total state space the system makes use of, the patterning of that use, and the timing and sequences of grid locations through which the system (the coach-athlete interaction) moves.

To date, only two studies have used the SSG method in sport psychology, both examinations of coach-athlete interaction. Erickson, Côté, Hollenstein, and Deakin (2011)
compared the dynamic coach-athlete interaction structures characterizing two competitive youth synchronized swimming teams, one more successful than the other with respect to both team performance and athletes’ perceived personal development. Turnnidge, Côté, Hollenstein, and Deakin (in press) used SSG’s to analyze coach-athlete interaction within an exemplary swimming program for athletes with physical disabilities. However, both these studies were single time-point designs on a very small-scale, with limited generalizability.

Overall, the studies within this dissertation aimed to build on these methodological innovations to allow more nuanced examination of interpersonal interaction in youth sport. In particular, SSG’s were utilized in the longitudinal study of coaching behaviour with a larger sample of coach-athlete dyads with specific attention to the unique interactions profiles of different athletes. Systematic observation more generally was also used to generate the first behavioural data of peer interactions in real-world informal sport play contexts.

**Overview of Program of Research**

The present program of research provides a two-pronged examination of the dominant interpersonal interactions in different youth sport contexts: coach-driven organized sport and youth-driven informal sport play. Interpersonal interactions in these two contexts were systematically observed and analyzed with respect to their influence on athlete development as conceptualized by the 4C’s framework. Given the significantly more advanced status of existing research on coach-athlete interactions in organized sport compared to research on peer interactions in informal sport play, the two branches of this program of research take different approaches to address relevant ‘next steps’ in each area. Studies 1 and 2 address coach-athlete interactions in organized sport contexts, building and extending from the extensive previous
research in the area while study 3 addresses peer interactions in informal sport play settings, a relatively new and unexplored area of research.

**Study 1. Capturing the motivational tone of coaches’ behaviour: Development of the Assessment of Coaching Tone (ACT) observational coding system**

The first study of the dissertation is methodological and presents the development and validation of a new observational coding system designed to capture the motivational tone of coaches’ interactive behaviour, above and beyond its pedagogical content. Based on a thorough review of previous empirical and theoretical literature, the new coding system (the ‘Assessment of Coaching Tone’ [ACT] system) was developed to reflect the integration of several major theoretical perspectives. While these theoretical perspectives have highlighted the critical role of tone-related qualities of coaches’ behaviour with respect to athlete experiences and development, to date there has been little if any work comprehensively addressing the behavioural manifestations of these qualities. By directly targeting the tone of coaches’ behaviour, the ACT provides a tool that allows researchers to expand our examination of coach behaviour and extend our understanding of coaches’ tone into the behavioural realm.

**Study 2. A season-long examination of the motivational tone of coach-athlete interactions in youth sport**

The second study of the dissertation used the ACT coding system developed in study 1 in a longitudinal examination of the influence of coaches’ interactive behaviour on athletes’ developmental trajectories over the course of a season. Fifty five competitive youth volleyball athletes and their coaches were observed at the beginning, middle, and end of their competitive season, including both observation of interactive behaviour and longitudinal tracking of changes in athletes’ developmental outcomes (the 4C’s). By taking coach-athlete dyads as the central unit
of analysis and utilizing a person-centred analytical strategy, this study was able to link the unique dyadic interaction profile of each coach with individual athletes to each athlete’s individual developmental trajectory and thus explain intra-team variation in athletes’ experiences over the course of the season. Further, analysis of these unique dyadic interaction profiles were focused on the coach’s relative usage of the motivational tone qualities identified in study 1, a previously unexplored aspect of coaching behaviour.

**Study 3. An exploratory examination of interpersonal interactions between peers in informal sport play contexts**

The third study of the dissertation addressed peer interactions in informal sport play contexts and presents an initial description of these processes to guide more detailed future research. Thirty young athletes were observed while participating in all-ages drop-in volleyball, soccer, and basketball sessions at a local recreation centre. Athletes completed measures of the 4C’s and their interactions with peers were recorded. Relationships between interaction patterns and the 4C’s were the focus of analysis. Given the notable lack of previous research in informal sport contexts, this study sought to conduct a preliminary examination of how the athlete-driven characteristics of these contexts (i.e., no coach) shape the dominant interpersonal interactions between peers. This preliminary examination was intended to provide a requisite ‘big picture’ of the contextualized interpersonal processes necessary for more detailed future study.
CHAPTER 3

Capturing the Motivational Tone of Coaches’ Behaviour: Development of the Assessment of Coaching Tone (ACT) Observational Coding System
Abstract

The importance of coaches’ interactive behaviour with respect to athlete development has long been recognized (Horn, 2008). While a number of observational coding systems exist to record the instructional content of coaches’ interactive behaviour, none are designed to explicitly capture the motivational tone of these interactions – ‘how’ coaches say what they say (Cushion, 2010). The current project entailed the development of a new behavioural coding system designed to focus on the motivational qualities of youth sport coaches’ interactive behaviour within a combined self-determination theory (Deci & Ryan, 2000) and achievement goal theory (Roberts, 2012) framework. Behaviour categories were developed through an iterative combination of literature review and observation of recorded youth sport coaching sessions. A coder training protocol was developed and refined until coders consistently met a minimum standard of agreement with respect to both inter- and intra-rater reliability. The full coding system was then validated across six different team and individual youth sports in multiple contexts over a one year period. The new coding instrument, comprised of a behaviour content dimension and three motivational tone dimensions, appears to be the first valid and reliable tool for systematically capturing the motivational tone of observed coach interactive behaviour.

KEYWORDS: Coach behaviour; Observation; Motivation; Youth sport
Capturing the Motivational Tone of Coaches’ Behaviour: Development of the Assessment of Coaching Tone (ACT) Observational Coding System

The purpose of the present study is to present a newly-developed observational coding system designed to capture the motivational tone of coaches’ behaviour toward youth athletes. Côté and Gilbert (2009) recently proposed a definition of coaching effectiveness with three central components: coaches’ knowledge, the context in which coaching takes place, and the outcomes experienced by the athletes as a result of that coaching. Coaches’ knowledge refers to the integration of professional, interpersonal, and intrapersonal knowledge and is reflected in the behaviours of the coach toward his/her athletes. Coaching context is determined by the age and competitive level of the athletes being coached. Potential developmental outcomes of coaching are conceptualized as the 4C’s: competence, confidence, connection, and character/caring. The 4C’s represent a broad range of not only performance but also psychological and social outcomes of sport participation. These authors argue that the degree to which coaches are effective is dependent on the fit between their coaching knowledge and the context in which they are coaching. The more congruent the fit between coaches’ knowledge and coaching context, the more likely it is that athletes will experience positive change in the 4C’s developmental outcomes.

If coaches’ knowledge is manifested in their behaviour, then in order to understand how positive developmental outcomes (e.g., 4C’s) are effectively promoted in a given context (i.e., youth sport), then we must have a thorough grasp of this contextually-linked behaviour. The study of coaching behaviour has long relied on behavioural observation as a primary method of study. In particular, the use of systematic observation protocols has a relatively long and productive history, dating back to the initial study of American college basketball coach John
Wooden by Tharp and Gallimore (1976). Since that initial study, the body of research examining youth sport coaching has relied primarily on two coding systems (Kahan, 1999): the Coaching Behavior Assessment System (CBAS: Smith, Smoll, & Hunt, 1977) and the Arizona State University Observation Instrument (ASUOI; Lacy & Darst, 1984).

Smith, Smoll, and colleagues (1977) initially developed the CBAS with observation of youth baseball coaches and classified coach behaviour into 12 distinct categories within two larger groupings (spontaneous and reactive behaviours). Spontaneous behaviours are initiated by the coach without reference to a preceding athlete behaviour and include: 1) general technical instruction, 2) general encouragement, 3) organization, and 4) general communication. Reactive behaviours are those exhibited directly in response to either a desirable performance/effort or a mistake by the athlete(s). Responses to desirable performance/effort are: 5) reinforcement and 6) non-reinforcement, while responses to mistakes are: 7) mistake-contingent encouragement, 8) mistake-contingent technical instruction, 9) punishment, 10) punitive technical instruction, and 11) ignoring mistakes. Finally, the CBAS includes one category representing response to misbehaviour: 12) keeping control. Smith, Smoll and colleagues, as well as other authors, have used the CBAS as the foundation of an extensive line of research (see Smith & Smoll, 2007) with coaches of youth sport athletes across several sports (e.g., baseball – Curtis, Smith & Smoll, 1979, basketball – Smith, Zane, Smoll, & Coppel, 1983, softball – Horn, 1985).

Similarly, the ASUOI (Lacy & Darst, 1984) was developed to systematically observe the teaching behaviours of coaches. Based on the premise that instruction is typically the most frequent general behaviour exhibited by coaches, the developers of the ASUOI sought to create a tool for more specific observation of instructional behaviours. The observation system itself contains 14 behavioural categories, 10 of which directly reflect different types of instruction. The
categories are: 1) pre-instruction, 2) concurrent instruction, 3) post-instruction, 4) questioning, 5) manual manipulation, 6) positive modelling, 7) negative modelling, 8) use of first name, 9) hustle, 10) praise, 11) scold, 12) management, 13) silence, and 14) other. While the majority of published youth sport research has utilized the CBAS, ASUOI or various modifications of these two (Kahan, 1999), a number of other coding systems have also been developed. Excellent examples such as the Coach Analysis and Intervention System (CAIS: Cushion, Harvey, Muir, & Nelson, 2012) and the Computerized Coaching Analysis System (CCAS: More & Franks, 1996) have made great strides in terms of contextualizing coaches’ instructional behaviour by recording various environmental elements in addition to the behaviour itself.

However, it has been suggested that this extensive body of research has examined a relatively limited scope of coaching behaviours and behavioural qualities (Horn, 2008). A significant majority of previous coach behaviour research has primarily targeted what might be termed ‘pedagogical’ behaviours – those explicitly involved in the teaching of motor skills. Analyses of these pedagogical behaviours have tended to centre on comparing the relative frequency of different positive and negative instructional/feedback behaviours. While this is obviously an important area of understanding for sport coaching, we argue that more and different dimensions of coaches’ behaviour also need to be examined in order to more fully understand the influence that coaches have on their young athletes. In particular, not only are analyses of different ‘whats’ (i.e., the content of behaviour exhibited) necessary but also analyses of the ‘hows’ (i.e., the presentational qualities of exhibited behaviours, regardless of content). The present coding system is one attempt to address this need, with a particular focus on the motivational tone of coaching behaviours.
A number of psychological theories have highlighted the importance of tone or related qualities of interpersonal communication (e.g., self-determination theory: Deci & Ryan, 2002; Ryan & Deci, 2000; achievement goal theory: Nicholls, 1984; Roberts, 2012; the multidimensional model of leadership: Chelladurai & Saleh, 1978; transformational leadership: Bass, 1985; positive youth development: Holt, 2008), and many have been used to examine the qualities of coaches’ behaviour specifically. This theoretically-guided research has linked differences in coaches’ interactive tone with a number of psychosocial outcomes encompassed within the 4C’s framework in young athletes (see Horn, 2008 for a review). However, this research has relied primarily on perceptions of coaches’ behaviour as rated by either athletes or the coaches themselves. Researchers (e.g., Ntoumanis, 2012) have highlighted in particular the need for behavioural assessment of treatment fidelity in theoretically-guided interventions. Little, if any, research has directly observed this behaviour and its motivational tone in real-world coaching contexts. This may, in part, be due to the lack of a reliable and validated observation instrument capable of capturing these qualities. Thus, the purpose of the present study was the development and validation of an observational coding system explicitly targeted at the motivational tone of youth sport coaches’ interactive behaviour.

Methods

Development of the Coding System

Brewer and Jones (2002) proposed a five-stage process for developing contextually valid observation instruments for sport research, consisting of: amending an existing observation instrument, establishing validity within the instrument, coder training, establishing inter-rater reliability, and establishing intra-rater reliability. Informed by this perspective, the present coding system was developed by progression through a number of stages, beginning with
reviews of previous observation systems and relevant theory. Once a final version of the coding system was established, a coder training protocol was created, inter- and intra-rater reliability were tested, and a number of types of validity were established. These stages will be presented separately in the results section.

Theoretical review. The development of the coding system began with a thorough review of observational systems used in previous youth sport coaching research (e.g., CBAS, ASUOI, etc.). Given the noted lack of emphasis on tone-related qualities in this previous research, however, there were few coding categories or behavioural dimensions relevant to the novel tone qualities of behaviour targeted in the current project. As such, we next turned to a survey of major psychological theories that have been empirically linked to athlete outcomes roughly covered under the 4C’s framework (Côté et al, 2010). The initial survey, discussed below, identified a number of theories postulating behavioural tone dimensions, some specific to coaching and other more general theories that address elements of coach/leader behaviour. After reviewing the basic content of each theory, we examined any questionnaires developed to examine the specific theoretical constructs as well as relevant theoretical or qualitative articles for each theory. The intent of this literature review was to identify any possible behavioural manifestations of tone that might apply to coaches’ behaviour and look for commonalities across theories that might point toward particularly influential dimensions of behaviour. The review primarily focused on sport psychology research but also included relevant work across the developmental psychology, organizational psychology, and education domains.

The strongest body of literature with regard to what might be considered elements of tone in coaches’ behaviour comes from two general theories of motivation: self-determination theory (SDT: Ryan & Deci, 2000; Deci & Ryan, 2002) and achievement goal theory (AGT: Nichols,
Despite their broad psychological foundation, both have been used extensively in sport research and place strong emphasis on leader (in this case, coach) behaviour as significant antecedents of athlete outcomes. Within self-determination theory, motivation is thought to exist on a continuum from fully extrinsic to fully intrinsic, differentiated by the degree to which one’s motivation is self-determined or regulated. Being further along the continuum toward fully intrinsic motivation has been empirically linked with a number of positive psychosocial outcomes (Weiss & Amorose, 2008; Ntoumanis, 2012). More intrinsic motivation is theorized to result from the satisfaction of three basic human needs: competence, relatedness, and autonomy. Of these, perceptions of individual autonomy has received significant research attention, both in youth sport and more generally, and been most strongly associated with the behaviour of leaders such as coaches. Coach behaviours that promote an athlete’s sense of autonomy are known as autonomy-supportive, while behaviours that inhibit or detract from a sense of autonomy are known as controlling. Examination of both questionnaires (e.g., Conroy & Coatsworth, 2007a; Conroy & Coatsworth, 2007b) and theoretical work (e.g., Mageau & Vallerand, 2003; Reeve & Jang, 2006; Bartholomew, Ntoumanis, & Thøgerson-Ntoumani, 2009) based on SDT suggests that autonomy-supportive and controlling coaching are not specific behaviours per se, but rather descriptive qualities of a range of possible behaviours. While several authors have provided notable foundations in elucidating the behavioural components of autonomy-supportive (Mageau & Vallerand, 2003) and controlling (Bartholomew et al, 2009) coaching, the specific behavioural manifestations have yet to be operationalized and tested at the level of utility for systematic observation. This qualitative description of coaching behaviour is representative of precisely the tone-related aspects that are the intended target of the present coding system. The work of Sarrazin, Tessier and colleagues in physical education (Sarrazin et
al, 2006; see also Tessier et al, 2008; 2010) provides excellent examples of the utility of observing actual autonomy-supportive and controlling behaviour. However, their measures have yet to be translated to the coaching domain and do not distinguish the autonomy-supportive/controlling aspects of the full range of behaviours (e.g., praise, encouragement, negative comments).

Achievement goal theory (Nichols, 1984; Roberts, 2012) also provides strong theoretical and empirical support for the importance of the motivational tone of coaches’ behaviour. According to AGT, individuals in any performance or achievement context such as sport are motivated to demonstrate competence or avoid the demonstration of incompetence. The nature of this motivation depends on the individual’s definition of competence, the achievement goal to which they are striving. Mastery- or task-oriented goals represent a conceptualization of competence defined relative to effort, learning, and self-referenced improvement and are a process-based perspective. Ego- or performance-oriented goals, in contrast, represent a conceptualization of competence defined relative to the performance of others and are generally a competitive outcome-based perspective. Overall, adoption of a mastery or task goal orientation is associated with positive motivational outcomes (Harwood, Spray, & Keegan, 2008; Roberts, 2012). One of the central tenets of AGT is that the larger situational motivational climate (again, mastery- or ego-oriented) is a primary determinant of an individual’s goal orientation and is created by the evaluation-related feedback from significant others within the context, such as coaches. As with autonomy-supportive or controlling coaching in SDT, the significant body of research examining coaches’ influence on motivational climate (e.g., Chaumeton & Duda, 1988; Newton, Duda, & Yin, 2000; Morgan, Sproule, Weigand, & Carpenter, 2005) suggests that a number of different evaluative behaviours might promote a master-oriented or ego-oriented
motivational climate. However, all behaviours promoting a mastery-oriented climate transmit the same message (i.e., that self-referenced effort and learning are valued) and produce similar motivational outcomes. Conversely, all behaviours promoting an ego-oriented climate transmit the opposite message (i.e., that other-referenced performance and ability are valued). Again, this would seem indicative of exactly the tone qualities that the present coding system is intended to address, where it is not the specific content of a given behaviour but rather its motivational tone that determines the behaviour’s influence on athlete development.

In addition to SDT and AGT, several other theories lend insight into the influence of tone qualities of coaches’ behaviours. Interestingly, similar themes to those outlined by SDT and AGT emerge across the range of theoretically-orientated bodies of research. Targeted at coaching specifically, the multidimensional model of leadership (MML: Chelladurai & Saleh, 1978; Reimer, 2008) posits that coaching effectiveness is determined by the degree of congruence between coaches’ actual behaviour, the behaviours desired by their athletes, and the behaviours necessitated by the coaching context. In classifying coaches’ actual, desired, and context-driven behaviour, the MML specifies a number of different behavioural dimensions (training and instruction, democratic behaviour, autocratic behaviour, social support, and positive feedback) the relative utilization of which reflects a tendency towards a specific decision-making style (autocratic, consultative, or group). Differences in these MML constructs have been linked to a number of athlete outcomes (Reimer, 2008). Examination of the primary questionnaire designed to assess perceptions of the behavioural dimensions of the MML (the Leadership Scale for Sports: Chelladurai & Saleh, 1980) as well as research examining coaches’ decision-making styles (e.g., Chelladurai, Haggerty, & Baxter, 1989) revealed descriptions of a number of possible behavioural manifestations of tone. In particular, the democratic and consultative
decision styles would seem to share much common ground with the concept of autonomy-support from SDT, with autocratic behaviour similar to controlling behaviour. Indeed, constructs from both theories have been found to be statistically linked in empirical studies (e.g., Hollembeak & Amorose, 2005).

The theory of transformational leadership (Bass, 1985) has more recently been applied to coaching settings and proposes a distinction between transactional and transformational leadership. Whereas transactional leadership centres on rewarding desired behaviour and punishing undesired behaviours in followers (i.e., athletes), transformational leadership focuses on creating an inspirational vision that helps and encourages followers to transcend their own current abilities to maximize their own and the group’s potential. Though a relatively new area of study in sport, leadership that is more transformational in nature has been empirically or theoretically linked to positive athlete outcomes such as increased performance, motivation, effort, and self-worth (e.g., Callow, Smith, Hardy, Arthur & Hardy, 2009; Rowold, 2006; Arthur, Woodman, Ong, Hardy, & Ntoumanis, 2011). Again, the accepted operationalizations of transformational leadership constructs such as individual consideration (elements of mastery-orientation), inspirational motivation (elements of autonomy-support and mastery-orientation), intellectual stimulation (elements of autonomy-support), and fostering acceptance of group goals and teamwork (elements of mastery-orientation) all include reference to what might be considered similar tone qualities of leader behaviour.

Similarly, the wide body of research on prosocial and positive youth development in sport, education, and developmental psychology (e.g., Holt, 2008; Weiss, Smith, & Stuntz, 2008) suggests that tone-related elements of the behaviour of significant adults (such as coaches) contributes to the development of personal responsibility (Hellison, Martinek, & Walsh, 2008),
life skills (Petitpas, Cornelius, & Van Raalte, 2008), fun (Bengoechea, Strean, & Williams, 2004), character (Sheilds & Bredemeier, 1995), prosocial behaviour, empathy, and sympathy (Eisenberg, 2003). This collected body of work again highlights the importance of interactions that foster athletes’ responsible independent decision making, engagement and empowerment (i.e., autonomy-support), as well as a general focus on the process of self-improvement rather than social comparison with respect to performance evaluation (i.e., mastery-orientation).

Thus, we suggest that motivational tone is a critical element of coaches’ behaviour in determining the outcomes experienced by athletes, and can be represented by the concepts of autonomy support and evaluation climate. We propose collapsing elements of motivational tone from across several theories into these two central SDT and AGT concepts; however, this should not be seen as a selection or promotion of SDT and AGT over the other theories reviewed. Rather, we feel that the highly utilized terminology and conceptualizations of SDT and AGT simply provide a parsimonious framework within which to integrate the shared intersections of the several major theories addressing a common topic. The behavioural manifestations of these larger tone dimensions, as gathered from across the multiple theories reviewed, were then used as base for the category descriptions and decision rules within the evolving coding manual.

**Initial validation.** With a working list of potential behavioural codes derived from the initial literature review, we began viewing and informal test coding of videotaped coaching sessions. This next phase of developing the coding system then consisted of an iterative process of viewing and test coding videotaped coaching sessions and re-review of relevant literature, with the aim of ensuring that the evolving coding system reflected and corresponded to both current theoretical knowledge as well as practical realities of real-world coaching. In the same vein, the coding system was reviewed by several coaches from multiple sports as well as youth
sport researchers experienced with behavioural observation. These processes supported the
general structure based on SDT and AGT terminology but led to further refinements of the
specific coding instructions and decision rules within each category.

Results

Final Coding System

The final Assessment of Coaching Tone (ACT) coding system consists of a content
dimension and three tone dimensions, with each content code being linked to specific applicable
tone modifier options (see Figure 1 for overview). Thus, any given coach behaviour is coded as a
two or three category sequence – a content code plus one or two associated tone modifiers. The
coding system is intended to be both exhaustive and exclusive; exhaustive in that all possible
coeaching behaviours can be appropriately classified within the existing categories, and exclusive
in that any given behaviour can only be appropriately classified by one specific category
sequence. The full coding manual for the final coding system is available upon request from the
corresponding author.

The coding sequence for any coach behaviour is initiated with a content code. Though
not the primary focus of this coding system and proportionately de-emphasized, this initial
content code acts as a necessary context upon which to ground the subsequent motivational tone
modifier categories. The content dimension consists of nine categories: 1) Organization -
communication from coach related to organization of practice tasks and athlete actions, NOT
intended to directly influence performance, 2) Instruction/Feedback - technical and/or tactical
and/or teaching instruction or feedback from coach, directed at athlete(s) motor performance or
skill execution, 3) Positive Evaluation/Encouragement - non-technical positive reaction or
motivational encouragement from coach directed at athlete(s) motor performance or skill
<table>
<thead>
<tr>
<th>Content</th>
<th>Autonomy Support</th>
<th>Evaluation Climate</th>
<th>Rapport</th>
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<tbody>
<tr>
<td>1 - Organization</td>
<td>1 - Autonomy-supportive</td>
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<td></td>
<td>2 – Neutral</td>
<td>4 – Mastery-oriented</td>
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<td></td>
<td>3 – Controlling</td>
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<td>6 – Ego-oriented</td>
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<td>2 - Instruction/Feedback</td>
<td>1 - Autonomy-supportive</td>
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<td>2 – Neutral</td>
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<td>3 - Positive Evaluation/Encouragement</td>
<td>1 - Autonomy-supportive</td>
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<td></td>
<td>2 – Neutral</td>
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<td>6 – Ego-oriented</td>
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<td>4 - Negative Evaluation</td>
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<td>3 – Controlling</td>
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<td>6 – Ego-oriented</td>
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<tr>
<td>5 - Mental Skills</td>
<td>1 - Autonomy-supportive</td>
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<td></td>
<td>2 – Neutral</td>
<td>4 – Mastery-oriented</td>
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<td>6 – Ego-oriented</td>
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<tr>
<td>6 - Social/Moral Behaviour</td>
<td>1 - Autonomy-supportive</td>
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<td>2 – Neutral</td>
<td>4 – Mastery-oriented</td>
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<td>6 – Ego-oriented</td>
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<tr>
<td>7 – Non-sport Communication</td>
<td></td>
<td>7 – Personal</td>
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<td>8 – General</td>
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<td>8 - Observation</td>
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<td>9 - Not Engaged</td>
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<tr>
<td>x - Uncodable</td>
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*Figure 1. Overview of the Assessment of Coaching Tone (ACT) observational coding system.*

Any given coach behaviour is classified according to the options within a single row.

evaluation, 4) *Negative Evaluation* - non-technical negative reaction by coach to an undesirable motor performance or skill execution by athlete(s), 5) *Mental Skills* - communication from coach related to individual mental/psychological skills, characteristics, qualities, or aspects of performance, 6) *Social/Moral Behaviour* - communication from coach related to inter- and intra-personal behaviour and conduct, NOT directed toward performance enhancement, 7) *Non-Sport*
Communication - communication from coach not directly related to task, performance, or personal development in the current team/training/performance context, 8) Observation - coach engaged in observing/watching athletes during training/performance activities, though not directly communicating with athletes, and 9) Not Engaged - coach not engaged in training/competition activities directed at athletes and not directly communicating with athletes. There is also an Uncodable category to capture instances where the coach’s behaviour is not visible or audible to be coded (only necessary when using continuous rather than event-based coding).

These categories are primarily taken directly from previous coach behaviour coding systems, most notably the CBAS and the more recent CAICS (Erickson, Côté, Hollenstein, & Deakin, 2011), which was itself a derivative of the original CBAS. There were, however, several modifications and new additions. First, as the function of the content dimension is merely to provide a contextual base for the more emphasized tone modifier dimensions, a number of content categories were collapsed to simplify the coding process. For example, instruction and feedback (from the CBAS) were combined into a single category representing all provision of technical/tactical information, as were positive evaluation and encouragement (from the CBAS) into a category representing all sport-related but non-technical positive communication. Additionally, the mental skills and social/moral behaviour categories were added to capture these important elements (Sheilds & Bredemeier, 1995; Eisenberg, 2003; Hellison et al, 2008) not explicitly represented in previous coding systems.

Once the initial content context is determined, the coder then proceeds to the critical motivational tone modifiers. Any organization, instruction/feedback, positive evaluation/encouragement, negative evaluation, mental skills, or social/moral behaviour content
must be classified by the expressed degree of autonomy-support. The degree of autonomy tone modifier dimension has three categories: 1) Autonomy-Supportive - conveys view of athlete(s) as capable decision makers and contributing members of the situation, 2) Neutral - absence of autonomy-related tone, and 3) Controlling - conveys an autocratic tone, with coach as total decision maker. As outlined in the ACT coding manual, there are a number of ways a given behavior can be expressed as autonomy-supportive, including: provision of choice, soliciting of athlete opinion(s), questioning (provided a response is actually allowed and expected), acknowledgement of athletes’ feelings or perspectives, provision of rationale or justification for decisions, encouragement of creativity/risk taking/independent problem solving, or acknowledgement of an individual’s role/contribution. Behaviours to be classified as controlling, on the other hand, indicate no athlete input, consultation, or acknowledgement of athlete(s’) perspective and typically take the form of directive statements, where the coach has already made the decision. Controlling behaviours can reflect current activities or coach-driven expectations for future behaviour (e.g., ‘should’ or ‘must’ statements) and can be positive statements (e.g., “I want you to keep that up next game”). Behaviours are to be classified as neutral on the autonomy tone dimension only if no criteria from either the autonomy-supportive or controlling categories are met (e.g., “Good”; Sarrazin et al, 2006).

After the degree of autonomy support has been coded, any instruction/feedback, positive evaluation/encouragement, negative evaluation, mental skills, or social/moral behaviour content must then be classified according to the evaluation climate it promotes. The evaluation climate tone modifier also has three categories: 1) Mastery-Oriented - self (individual athlete)-referenced or focused on the process of skill execution, 2) Neutral - absence of evaluation climate-related tone, and 3) Ego-Oriented - other (comparative)-referenced or focused on the competitive
outcome of skill execution. In order to be classified as mastery-oriented, a behaviour must reflect
discussion of learning or performance relative to own past performance (self-referenced - e.g.,
“that was much better than yesterday”) or process, rather than competitive outcome, based
feedback (e.g., “good follow-through on that one!”). Reference to effort is also considered
process-based feedback. In contrast, behaviour that promotes an ego-oriented evaluation climate
reflects discussion of relative ability or performance in comparison to others, such as teammates
or opponents (e.g., “nice work beating that defender!”) or outcome, rather than process, based
feedback (e.g., “Nice win”). Again, behaviours are to be classified as neutral on the evaluation
climate dimension only if no criteria from either the mastery-oriented or ego-oriented categories
are met (e.g., “Good”).

Not explicitly grounded in the SDT or AGT frameworks, a third and final modifier
dimension – rapport - was created to describe the relatively distinct non-sport communication
content code. While not to the same degree as autonomy-support and evaluation climate, the
importance of coaches’ personal connection with athletes beyond the sport context is also
highlighted in much of the reviewed literature across several theories (e.g., Chelladurai & Saleh,
1980; Bridges, 2003; Bengoechea et al., 2004; Callow et al., 2009). Even within SDT, the degree
of coaches’ interpersonal involvement with athletes has been posited as an influential element of
these interactions (Ntoumanis, 2012). Within the rapport dimension, any non-sport
communication is classified as either 1) Personal - communication from the coach making direct
reference to personal information about the athlete, or 2) General - communication from the
coach NOT making direct reference to personal information about the athlete. Personal
information refers to athlete’s feelings, perspectives/opinions, life circumstances, or experiences
outside of sport (i.e., school, family, relationships, etc.). Personal non-sport communication can
take the form of a question, requesting personal information (e.g., “how was school today?”,
“what do you think of that movie?”, etc.), or can also take the form of a statement, reflecting
previous knowledge of athlete’s personal information (e.g., “I know you were feeling pretty low
last week”, “Congratulations on finishing exams!”, etc.).

All three of the newly proposed motivational tone modifier dimensions require what
Alexander, Newell, Robbins, and Turner (1995) classify as moderate levels of content meaning
and coder inference in order to arrive at accurate coding. Content meaning refers to the degree to
which the coder has freedom to use phenomenological meaning to independently define a given
coding unit (i.e., what constitutes a behaviour to be coded) as opposed to pre-determined units of
analysis (e.g., specified time intervals). In this case, a moderate level of content meaning
indicates that coders are looking for discrete interaction segments but are free to decide whether
a single sentence, part of a sentence, or many sentences together represent the meaning unit in
question. Similarly, coder inference refers to the degree to which the coding system requires the
coder to infer meaning from behaviour in order to classify it, as opposed to relying solely on the
explicit content of the behaviour (e.g., word choice). In this case, a moderate level of coder
inference means that while the coding manual gives strict definitions for the motivational tone
categories and examples of possible ways in which each could be manifested behaviourally,
coders are required to make judgements about the autonomy-support, evaluation climate, or
rapport meaning for any given behaviour, regardless of the specific phrasing chosen by the coach
to express it. This moderate level of both content meaning and coder inference were deliberately
chosen to reflect both the theoretical conceptualization and intended level of analysis for these
new behavioural dimensions.

Testing of Coding System
Coder training protocol. In order to reliably and accurately record coaching behaviours using the ACT coding system, coders must be trained to implement the system as intended. To this end, a six-stage coder training protocol was developed during the testing of the final coding system. This training protocol began with an introductory discussion of systematic observation research and presentation of the coding manual (available upon request from the corresponding author) with detailed explanation of the overall purpose and of each behavioural dimension and specific behavioural category. Coders were then given a copy of the full coding manual for independent study for several days till they felt familiar with the descriptions of all the coding categories. At this point, the coders wrote a pencil-and-paper test requiring them to classify hypothetical coaching statements, using the full coding system with all dimensions. The written descriptions were purposely selected to provide maximal ambiguity with regard to behavioural criteria in order to target perceived ‘grey areas’ between adjacent code categories. The purpose of this test was twofold; both an initial check on coders’ understanding of the coding system as well as a cue for discussion of difficult coding decisions and clarification of category interpretations. As such, discrepant answers between coder trainees served as valuable teaching opportunities. Coders then proceeded to group-based verbal coding of videotaped coaching sessions, guided by the primary researcher, where all coders were given a chance to talk through their reasoning for any coding decisions. The next stage of training involved group-based full coding, again guided by the primary researcher, where each coder took turns running the coding software currently used by the research team (Noldus Observer: Noldus, Trienes, Hendricksen, Jansen, & Jansen 2000) but were able to discuss coding decisions as a collective. Thus, the introductory phases of the training protocol represent a progression of coding situations from most straight-forward (distinct statements transcribed on paper) to most complex (videotaped
real-world coaching segments where temporal boundaries between different behaviours are not always clear).

Coders then progressed to independent coding assignments, where they were asked to code short (i.e., approximately 10 minutes) videotaped segments of various coaching sessions. Each of these assignments was used to calculate inter-rater reliability with a ‘gold standard’ coding of the same segment by the primary researcher. Any agreements and disagreements were reviewed as a group to further ensure accurate and consistent interpretation of the coding categories. This process of independent coding assignments followed by comparison to the ‘gold standard’ coding and group review was continued until coders reached a minimum reliability standard (see next section) on two consecutive coding assignments, at which point they were considered fully trained. Following training and after the initiation of coding videos to be used for analyses, periodic group coding sessions were held to combat observer drift (i.e., increasingly idiosyncratic interpretations of the coding categories) and ensure fidelity to the coding system as originally designed.

Reliability. Reliability analyses for the final coding system were conducted with respect to both inter- and intra-rater reliability. Reliability was based on a minimum standard of agreement set at 75% agreement (e.g., Hollenstein et al, 2004), with agreement characterized by frequency, time of occurrence, and duration dimensions for each behaviour. Thus, agreement in the coding of any given behaviour required the activation of the same complete two or three code sequence by both coders within a three second window (relative to total elapsed time on the video) and subsequent deactivation by initiation of the next code when the coach’s behaviour changes, again within a three second window. This represents an extremely stringent definition of agreement, in effect demonstrating concordance in four or five coding decisions (i.e., time of
behaviour initiation, content, one or two tone modifiers, and time of behaviour termination) for any single coaching behaviour.

**Inter-rater reliability.** Inter-rater reliability was based on agreement with a ‘gold standard’ coding by the primary researcher. Seven independent coders were trained to the minimum 75% reliability standard (range on coding tests = 76-89% agreement, Kappa range = .63-.80) within 2 months, with no trained coders failing to meet this standard. Re-tests of inter-rater reliability were conducted approximately 2 months after initial completion of coder training and the minimum 75% agreement standard was maintained (range = 75-87% agreement, Kappa range = .62-.77).

**Intra-rater reliability.** Intra-rater reliability was assessed by having coders recode segments of video at minimum two weeks subsequent to their initial coding of the same segments. All coders reached at least the minimum 75% agreement standard (range = 76-80% agreement, Kappa range = .67-.71).

**Validity.** Several validation strategies were utilized during the development and testing of the final coding system.

**Generalizability.** First, both development and testing of the coding system was conducted with videos from a wide range of youth sport settings, including both team (volleyball, basketball, soccer, synchronized swimming) and individual (swimming, tennis) sports, from both Canada and Australia, with male and female coaches of both single gender and mixed participation sport groups, and included both able-bodied athletes and athletes with disabilities.

**Comprehensive/exhaustive coverage.** Second, within all these particular attention was paid to ensuring the comprehensiveness and exhaustiveness of the coding categories across the wide range of youth sport settings. If either the researchers or coders noted any instances where a
behaviour exhibited by a coach could not be appropriately categorized within the existing system, modifications or adjustments were made to either the behavioural categories or the specific coding rules within each category. Again, any such modifications were reviewed by several coaches from multiple different sports as well as youth sport researchers experienced with behavioural observation, ensuring face and theoretical validity.

**Discriminant validity.** Finally, the full coding system was used to recode video from an earlier study by Erickson et al. (2011) which compared the coaches of two competitive youth synchronized swimming teams, one more successful with respect to both personal development and team performance than the other, across three training sessions. Simple analysis of this recoding offers support for the discriminant validity of the newly developed ACT coding system, in that the two environments could be differentiated based on relative utilization of different motivational tones captured by the new system. Given the small number of sessions compared, full statistical analysis was not possible; however, even a relatively superficial direct comparison of means revealed several possible differences between the two coaches.

On the evaluation climate dimension, despite exhibiting fewer overall interactive behaviours (more successful [MS] = 310.33 behaviours/session vs. less successful [LS] = 465.67 behaviours/session), the coach of the more successful team spent a greater duration of time interacting in a Mastery-oriented manner across all content categories (MS = 1024.00 seconds/sess. vs. LS = 981.00 seconds/sess.). This discrepancy was most noticeable with respect to Instruction/Feedback content (MS = 964.33 sec/sess. vs. LS = 911.67 sec/sess.), again despite the coach of the more successful team exhibiting fewer instances of Instruction/Feedback overall (MS = 121.00 beh./sess. vs. LS = 199.33 beh./sess.). Further, not once across all three observed practices did the coach of the more successful team utilize an Ego-oriented tone with any content
category, in contrast to the coach of the less successful team (10.33 beh./sess.). With respect to the degree of autonomy support dimension, the coach of the less successful team spent much more time interacting in a Controlling tone with both Positive Evaluation/Encouragement (MS = 9.00 sec/sess. vs. LS = 39.33 sec/sess.) and Negative Evaluation (MS = 3.33 sec/sess. vs. LS = 48.67 sec/sess.) content. Finally, the coach of the more successful team spent more time in Non-Sport Communication characterized by Personal-oriented rapport (MS = 49.33 sec/sess. vs. LS = 5.33 sec/sess.).

Discussion

With the development of the ACT coding system as presented here, we suggest that this represents the first valid and reliable observational coding system explicitly targeted at the motivational tone of youth sport coaches’ interactive behaviour. This coding system will allow for the examination of new, theoretically-relevant aspects of coaching behaviour and begin to answer previously unavailable research questions. It should be noted that the investigation of motivational tone is intended to extend, not replace, pedagogical understanding of coach behaviour. In fact, the two are not necessarily completely distinct but rather complementary (e.g., questioning/athlete input may promote reflective learning – Jonker, Elferink-Gemser, de Roos, & Visscher, 2012; Lewthwaite & Wulf, 2012). It is also important to note that the driving impetus in the creation of this coding system was not to develop a tool to specifically test SDT or AGT predictions (though that is certainly a possible use, e.g., the evaluation of treatment fidelity suggested by Ntoumanis, 2012). Rather, we sought to improve our ability to examine new and different qualities of coaches’ behaviour, and in the process settled on the use of SDT and AGT general concepts and terminology as the most parsimonious integration of several relevant theoretical conceptualizations.
While developed and validated as a complete coding system within youth sport contexts, the ACT coding system is intended to be flexible in its utility, providing a validated framework for context/research question-specific modifications (Brewer & Jones, 2002). For example, the system could potentially be used to observe coaches in other sport contexts (e.g., high performance) or physical educators, as the theoretical foundations of SDT, AGT, and related concepts have been validated across these contexts as well (see Roberts & Treasure, 2012). Within the authors’ line of research for which this coding system was developed, the motivational tone of coaches’ behaviour will be further qualified by recording the recipient (i.e. specific athlete or group of athletes) to which the behaviour is directed, as well as the training or competition context in which it takes place. Future research might also consider collapse or expansion across categories (e.g., expansion of types of autonomy-supportive behaviours, such as questioning, into separate codes). Regardless of the specific context or research question under study, the ACT coding system is intended to be suitable for use in full spectrum of observational data collection procedures (i.e., from full detail, continuous computerized coding from video to time constrained, live hand-recorded coding with various event-based or time-sampling procedures).

**Perspective**

This paper presents the development of the Assessment of Coaching Tone (ACT) observational coding system, explicitly targeted to capture the motivational tone of youth sport coaches’ interactive behaviour toward their athletes. The results of several strategies employed to establish the reliability and validity of the system are also presented. While acknowledged as a significant component of coaches’ interactions, motivational tone has yet to be comprehensively examined from a behavioural observation perspective, perhaps due to a lack of validated
observation instruments designed for this context. While certainly not the final word in the examination of coaching behaviour, we feel the ACT coding system begins to address this gap and improves our ability to observe and understand the complexity of coaching behaviour beyond instructional strategies. It is our hope that this and related tools can be used to better predict the influence of coaches on athlete development, and in doing so enable more effective training of youth sport coaches.

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CHAPTER 4

A season-long examination of the motivational tone of coach-athlete interactions in youth sport
Abstract

Coaches are a primary influences on athletes’ experiences and development in youth sport (Fraser-Thomas, Côté, & Deakin, 2005; Horn, 2008). However, the motivational tone of coaches’ behaviour has not been directly observed, nor has its influence on athlete development been examined. The purpose of this short-term longitudinal study was to examine potential associations between the motivational tone exhibited by competitive youth sport coaches in their individualized interactions with athletes and athletes’ developmental trajectories over the course of a competitive season. Fifty-five coach-athlete dyads from five competitive youth volleyball teams were observed at three time points. Athletes in each dyad completed measures of the 4C’s of athlete development at each time point. Cluster analysis revealed the presence of three distinct clusters based on athletes’ developmental trajectories over the course of the season: 1) high and increasing, 2) low and decreasing, and 3) moderate and maintaining. Profile analysis confirmed the longitudinal trajectories were significantly different between all clusters across all 4C’s. Analysis of dyadic interaction profiles revealed significant differences in interactive behaviour between clusters. Athletes in the low and decreasing cluster experienced significantly more performance-related interaction from their coach with a mastery or controlling motivational tone. Athletes in the high and increasing cluster experienced significantly more non-sport related communication from their coach. The present study on motivational tone lends insight into “how” coaches interact with their athletes, beyond simply “what” they say, and the resulting influence on athlete development. The results suggest that even with typically beneficial motivational tone, the relative amount of interaction in relation to other athletes may be critical to its effectiveness. Further, this study supports the importance of not limiting coach-athlete
interactions to purely sport-related matters and communicating with young people as more than just athletes.
A season-long examination of the motivational tone of coach-athlete interactions in youth sport

Coaches are one of the primary influences on athletes’ experiences in sport. Within youth sport particularly, the role of coaches in facilitating positive developmental experiences is of utmost importance (Fraser-Thomas, Côté, & Deakin, 2005; Horn, 2008). This study presents a season-long examination of the ways in which youth sport coaches interact with their athletes and how these interactions influence the course of athlete development.

Motivational Tone

A significant body of research exists that addresses youth sport coaches’ behaviour, particularly with respect to influences on athlete development (Erickson & Gilbert, 2013). This literature has provided an excellent foundation of knowledge with demonstrated practical utility (e.g., Smith & Smoll, 2007). However, much of the observational research within this field has targeted the pedagogical or instructional content of coaches’ behaviour and a number of authors (Cushion, 2010; Horn, 2008) have suggested that a complete understanding of coaches’ influence on athletes will necessarily require additional examination of a broader range of behaviours and behaviour qualities. We suggest that one such behavioural quality is the notion of motivational tone (Erickson & Côté, submitted [study 1]). Motivational tone is intended to capture not ‘what’ coaches say, but rather ‘how’ they say it.

This notion of motivational tone as an important quality of coaches’ behaviour is present in some form in a number of different theoretical approaches. The strongest empirical support for the importance of the tone of coaches’ behaviour comes from two general theories of motivation: self-determination theory (SDT: Deci & Ryan, 2002; Ryan & Deci, 2000) and achievement goal theory (AGT: Nichols, 1984; Roberts, 2012). Within the extensive SDT literature in sport (see
review by Ntoumanis, 2012), the degree to which coaches’ behaviour provides support for athletes’ functioning as autonomous individuals is known to be a key contributor to positive athlete experiences. For example, perceptions of more autonomy-supportive coach behaviour in youth sport have been associated with positive athlete outcomes such as well-being (Adie, Duda, Ntoumanis, 2012) and initiative and identity reflection (Coatsworth & Conroy, 2009). According to SDT, athletes’ perceive coaches’ behaviour as autonomy-supportive, or conversely, as controlling (i.e., limiting their personal autonomy and positioning the coach as the final decision-making authority) above and beyond the particular content of the behaviour (e.g., instruction, encouragement, etc.). This differential perception is precisely the type of presentational quality of coach behaviour represented by the notion of motivational tone.

Similarly, decades of AGT research (see review by Roberts, 2012) has highlighted the significant role of coaches in creating the overall motivational climate experienced by athletes. Motivational climate refers to athletes’ perceptions of the predominant criteria used to evaluate competence in a given setting and is a primary determinant of individuals’ goal orientations – the achievement goal to which they are striving. Within AGT, the motivational climate of a given setting can be classified as either mastery- or task-oriented; mastery climates promote evaluation of competence based on effort, learning, and self-referenced improvement while task climates promote evaluation of competence relative to the performance of others. Research in youth sport contexts has demonstrated that more mastery-oriented climates are associated with a number of positive athlete outcomes including increased sportspersonship, sport enjoyment and liking of the coach (e.g., Cumming, Smoll, Smith, & Grossbard, 2007; Miller, Roberts, & Ommundsen, 2004). These findings have been further validated through successful coach training interventions designed to help coaches create a mastery-oriented climate (e.g., Coatsworth &
The accumulated body of literature suggests that athletes’ perceptions of the coach-created motivational climate are based on the evaluation-relevant meaning conveyed by the coach’s behaviour (i.e., its motivational tone), rather than the specific content or wording.

Given the extensive empirical support for both SDT and AGT, a number of authors have combined elements of both theories in examinations of athlete experiences in sport (e.g., Keegan, Harwood, Spray, & Lavallee, 2009; Standage, Duda, & Ntoumanis, 2003). These studies highlight the unique contributions of both SDT and AGT concepts to understanding coaches’ influence on their athletes. Further, Erickson and Côté (submitted) [study 1] argued that the combined concepts of autonomy-support from SDT and evaluative (motivational) climate from AGT together capture a parsimonious conceptualization of the motivational tone of coaches’ behaviour, representative of tone-related elements common across multiple theoretical frameworks such as the multidimensional model of leadership (MML: Chelladurai & Saleh, 1978; Reimer, 2007), transformational leadership (Arthur, Woodman, Ong, Hardy, & Ntoumanis, 2011; Bass, 1985), and positive youth development (e.g., Holt, 2008; Weiss, Smith, & Stuntz, 2008).

While there appears to be strong support across multiple theories for motivational tone as an influential quality of coaches’ behaviour, the vast majority of research has investigated these tone-related characteristics with respect to the perceptions of athletes or coaches, primarily with questionnaire or qualitative methods. To our knowledge, no research has explicitly observed the coaching behaviours that influence these perceptions. Several researchers have made strong theoretical arguments outlining behaviours thought to constitute, for example, autonomy-supportive or controlling coaching (e.g., Bartholomew, Ntoumanis, & Thøgerson-Ntoumani,
2009; Mageau & Vallerand, 2003). However, previous research has not directly observed these types of behavioural qualities, particularly within youth sport settings, nor has the influence of the motivational tone of directly observed coach behaviours been examined with respect to athlete development.

**Coaching and Athlete Development**

Several authors (e.g., Côté & Gilbert, 2009; Horn, 2008) have suggested that coaching effectiveness is best understood as the degree to which coaches positively influence athletes’ development. To that end, athlete development has traditionally been conceptualized as solely the development of sport talent. Recent work in sport drawing from the positive youth development literature has promoted a more holistic view of athlete development, concerned with aspects of the athlete as a person beyond simply their sport skill and ability. One way in which this holistic view has been operationalized is as the 4C’s of athlete development (Côté, Bruner, Erickson, Strachan, & Fraser-Thomas, 2010; Côté & Gilbert, 2009), which are competence, confidence, connection, and character. The 4C’s are a sport-specific modification of the 5C’s framework used extensively within the more general positive youth development literature (Lerner, 2004; Lerner et al, 2005; Roth & Brooks-Gunn, 2003). In moving from 5 to 4 C’s, the caring/compassion dimension of the original C’s was collapsed into the character dimension to better reflect the overlapping conceptualization of these constructs within the sport psychology literature. The combination of all 4C’s is intended to encompass the full spectrum of positive developmental outcomes associated with sport participation and represent the desired products of holistic athlete development (Vierimaa, Erickson, Côté, & Gilbert, 2012).

Recent theoretical work in coaching (e.g., Cushion, Armour, & Jones, 2006; Jones, Bowes, & Kingston, 2010) has highlighted the reciprocally interactive nature of the coaching
process, whereby interactive behaviour by the coach or athlete influences subsequent behaviours by the other and thus the overall path of the interaction. Neither coach nor athlete act as an independent unit but are instead highly interdependent in their behaviour over time. In order to address this discrepancy, Poczwardowski, Barott, and Jowett (2006) suggest shifting from a focus on the individual to the inter-individual, specifically coach-athlete dyads, as the central unit of coaching study. This shift is consistent with a number of general theories of human development (see Lerner, 2002), which highlight that both the reciprocally influential (i.e., both actors) and temporal dimensions of interpersonal interactions are critical to understanding their influence on human development.

Therefore, in order to truly understand the influence of these dyadic coach-athlete interactions on athlete development, we must first obtain a clear picture of their real-time dynamics in context, incorporating both interactive parties and unique to each dyad. Further, we must then situate these dynamic interactions within the larger progression of time encompassing athlete development. It might then be asked how differences in these individualized real-time interaction dynamics contribute to the overall longitudinal trajectories of athlete development. In capturing all these elements, the present study is thus an examination of the relationship between two time scales, real time and developmental/longitudinal time; how real-time interaction dynamics (micro scale) influence change in athlete outcomes over developmental time (macro scale).

**Purpose**

The present study was an exploration of coaching effectiveness in competitive youth sport contexts. In particular, the purpose of this short-term longitudinal study was to examine potential associations between the motivational tone exhibited by competitive youth sport
coaches in their individualized interactions with athletes and athletes’ developmental trajectories over the course of a competitive season.

Methods

Participants

Participants for the present study were the head coaches \((n = 5)\) and all athletes \((n = 55)\) from five competitive youth volleyball teams within a single club in a mid-size Canadian city. Participating teams were from the under 15 (U15), U16, U17, and U18 girls and U18 boys age groups and as such, the athletes were predominantly female \((n = 45, 82\%)\). Two coaches were female (U16 and U18 girls) and three were male (U15 and U17 girls, U18 boys). Coaches ranged in age from 22 to 65 years old, with 7 to 42 years of previous volleyball coaching experience. One coach had never played volleyball as an athlete, two had played youth club level, and two had played university level volleyball as athletes. Informed consent was granted by all participants before the initiation of data collection. All study procedures were approved by the general research ethics review board at the researchers’ home university and by the volleyball club’s executive committee.

Procedure

After recruitment, participating teams were observed during training sessions at three times point roughly corresponding to the beginning, middle, and end of their season (the full competitive season ran from November through May). Each observed session was recorded on video with two separate HD camcorders, one focused exclusively on the coach and the other taking a wide-angle perspective to capture the full training context and activities. To record audio of the training session, each head coach wore a wireless lapel microphone linked to the camcorder focused on him/her, while the wide-angle camcorder was linked to a large parabolic
microphone to capture verbalizations from all athletes as well. The two video and audio streams were then time synchronized and combined into a single split-screen video file for each practice. At each of the three time points, all athletes and coaches also completed a questionnaire packet measuring the 4C’s (competence, confidence, connection, and character).

**Measures**

**Behavioural observation.** Behavioural data for coaches and athletes was collected via systematic observation of the videotapes of recorded training sessions by two independent coders not involved in study design or data collection. The observational data coding was conducted in a continuous manner for each participant, such that one of the behavioural codes was active for each participant at any given moment of the observed session and the activation of a particular code indicated the end of the previous code for that participant, resulting in stream of time series data. Continuous coding therefore allows the calculation of both the frequency and duration of behaviours. All behavioural coding was conducted with Noldus Observer software (Version 9: Noldus, Trienes, Hendricksen, Jansen, & Jansen, 2000).

Systematic observation of coaching behaviour, the primary target of investigation, was conducted according to the Assessment of Coaching Tone (ACT) observational coding system (Erickson & Côté, submitted [study 1]). Developed specifically to capture the motivational tone of coaches’ behaviour, the ACT has been subject to rigorous reliability testing and validation. Both coders for the present study progressed through the standardized training protocol and met both the inter- and intra-rater reliability standards described for the initial development of the ACT prior to coding video for analysis. Further, both coders maintained these standards in subsequent reliability checks during coding of videos for analysis (see Erickson & Côté,
submitted [study 1] for full details of coder training and reliability testing standards, as well as system validation strategies).

The ACT is comprised of a behaviour content dimension and three motivational tone dimensions. Each coach behaviour is classified by the combination of a content code and one or two corresponding motivational tone modifiers (depending on which content code is selected) and can only be appropriately classified by a single combination (i.e., all codes within a single dimension are mutually exclusive). While a brief description of the dimensions and the behavioural categories contained within each is presented below, full details of the coding system including decision rules and specific examples can found in the ACT coding manual (available upon request from the corresponding author; see also Erickson & Côté, submitted [study 1]).

The initial content dimension is not the central focus of the ACT, but does provide a general context upon which to ground the subsequent motivational tone modifier categories. The content dimension consists of nine categories: 1) organization, 2) instruction/feedback, 3) positive evaluation/encouragement, 4) negative evaluation, 5) discussion of mental skills, 6) discussion of social/moral behaviour, 7) non-sport communication, 8) observation, and 9) not engaged.

Once the initial content code has been selected, a given behaviour is then coded for its motivational tone – the primary feature of interest. The three motivational tone dimensions are intended to capture the degree of autonomy support, the evaluation climate promoted, and the degree of personal rapport conveyed by any given coach behaviour. The first motivational tone dimension, degree of autonomy support, qualifies any behaviour initially coded as organization, instruction/feedback, positive evaluation/encouragement, negative evaluation, mental skills, or
social/moral behaviour content. The degree of autonomy support is classified according to one of three categories: 1) *Autonomy-supportive* - conveys view of athlete(s) as capable decision maker and contributing member of the situation, 2) *Neutral* - absence of autonomy-related tone, or 3) *Controlling* - conveys an autocratic tone, with coach as total decision maker. The second motivational tone dimension, evaluation climate, qualifies any behaviour initially coded as instruction/feedback, positive evaluation/encouragement, negative evaluation, mental skills, or social/moral content. The evaluation climate promoted is also classified according to one of three categories: 1) *Mastery-Oriented* - self-referenced or focused on the process of skill execution, 2) *Neutral* - absence of evaluation climate-related tone, and 3) *Ego-Oriented* - other (comparative)-referenced or focused on the competitive outcome of skill execution. The third and final motivational tone dimension, degree of personal rapport, applies only to non-sport communication content and is classified according to one of two categories: 1) *Personal* - communication from the coach making direct reference to personal information about the athlete, or 2) *General* - communication from the coach NOT making direct reference to personal information about the athlete.

For athlete behaviour, given the focus on coach-athlete interactions in the present study, only explicitly interactive behaviours directed at the coach were coded. Subject to the same reliability standards as the coding of coach behaviour, athlete behaviours were classified according to a simple five code categorization scheme: 1. *Engaged* – athlete not directly communicating to coach, 2. *Acknowledgement* – simple confirmation of communication from coach, 3. *Coach Talk: Controlled* – communicating with coach where an a priori “correct”, coach-decided answer is assumed, 4) *Coach Talk: Input* – communicating with coach where
athlete contributes new information, opinions, observations, etc., and 5) Coach Talk: General – communicating with coach about non-sport/performance matters.

**Athlete outcomes.** Athlete outcomes focused on measurement of the 4C’s – competence, confidence, connection, and character. The specific battery of measures chosen was based on the extensive review and recommendations of Vierimaa and colleagues (2012) in their work on measurement of the 4C’s in youth sport contexts. Competence was assessed through subjective ratings from both the athletes and coach. Athletes’ confidence, connection, and character development were each measured through psychometrically validated self-report questionnaires. For ratings of all C’s, athletes were instructed to refer only to their current organized sport context.

Athletes’ competence was measured using the Sport Competence Inventory developed by Vierimaa et al. (2012), based on the work of Causgrove, Dunn, & Bayduza (2007). In the Sport Competence Inventory, sport competence is conceptualized as consisting of three elements: technical skill, tactical skill, and physical skill. For each individual athlete, each of these three elements was rated on a 5-point Likert scale ranging from ‘Not at all competent’ to ‘Extremely competent’ by the athlete themselves, the coach, and all of their peers. Thus, the final competence score for each athlete, calculated as the average of the ratings from each of these sources across all three elements, represents a triangulation of the perceptions of multiple evaluators. For the present sample, Cronbach’s alpha assessing internal reliability was .70.

Confidence was measured using the self-confidence subscale of the Revised Competitive State Anxiety-2 (CSAI-2R: Cox, Martens, & Russell, 2003). The self-confidence subscale is made up of 5 items (e.g., ‘I’m confident I can meet the challenge’) that are scored on a 4-point Likert-type scale ranging from ‘Not at all’ to ‘Very much so’. As the original version of the
CSAI-2R targeted state confidence, the instructions were modified for the present study in line with the recommendations of Vierimaa et al (2012) to target trait sport confidence instead (i.e., “indicate how you generally feel” rather than “indicate how you feel right now”). The CSAI-2R has been validated with two independent samples of athletes and a confirmatory factor analysis revealed that the self-confidence subscale demonstrates good psychometric properties with standardized path coefficients of .69 to .80 (Cox et al, 2003). For the present sample, Cronbach’s alpha assessing internal reliability was .80.

Connection, operationalized for this study as the quality of the relationship between coach and athlete, was measured by the Coach-Athlete Relationship Questionnaire (CART-Q: Jowett & Ntoumanis, 2004). The CART-Q, based on the 3 C’s (closeness, commitment, and complementarity) model of coach-athlete relationships, is an 11-item questionnaire with three subscales designed to evaluate the affective/closeness, cognitive/commitment, and behavioural/complementarity dimensions of the dyad’s relationship. All items (e.g., ‘I trust my coach’) are scored on a 7-point Likert-type scale ranging from ‘Not at all’ to ‘Extremely’. Each of these scales has been shown to be sufficiently reliable (Cronbach’s alphas = .82 - .88; Jowett & Ntoumanis, 2004). For the present study, the three subscales were averaged to form an overall relationship quality index. For the present sample, Cronbach’s alpha assessing internal reliability was .95.

Character was measured by the Prosocial and Antisocial Behavior in Sport Scale (PABSS: Kavussanu & Boardley, 2009). The PABSS is a 20-item questionnaire assessing how often athletes engage in specific prosocial (e.g., ‘encouraged a teammate’) and antisocial (e.g., ‘criticized an opponent’) behaviours during the current season. All items are scored on a 5-point Likert-type scale ranging from ‘Never’ to ‘Very Often’. Both the prosocial and antisocial
dimensions can be further broken down into behaviours directed toward teammates and
behaviour directed toward opponents. Each of these four subscales has shown good internal
reliability (Cranbach’s alphas = .74 - .86; Kavussanu & Boardley, 2009). For the present study,
the larger prosocial and antisocial dimensions were of most interest, with an overall character
score calculated for each athlete as their score on the prosocial dimension minus their score on
the antisocial dimension. As a single comprehensive score representing character was desired,
the prosocial minus antisocial calculation was chosen to operationalize character as the relative
balance between these two opposing dimensions. Thus, athletes with high character scores
indicated relatively higher self-reported levels of prosocial behaviours and relatively lower levels
of antisocial behaviours. For the present sample, Cronbach’s alpha assessing internal reliability
was .63 for the prosocial dimension and .88 for the antisocial dimension.

**Data Analysis**

The data analysis strategy for this study was based on a person-centred, rather than
variable-centred, approach. As such, the central focus was on the experiences of individual
athletes and thus on the grouping or differences between cases in their entirety (i.e., on all
variables) rather than relationships between scores on variables independent of the person
reporting them. All statistical analyses were conducted with SPSS software (version 21).

After initial data screening, analysis of the 4C’s questionnaire data consisted of three
major stages. For the first two stages, the measures of each C were standardized to a 5-point
scale (if not already scored out of 5) then combined to form an overall 4C’s measure out of 20
for each athlete at each of the three time points. The first stage was a $K$-means cluster analysis
intended to identify natural groupings of cases based on the combined 4C’s measure at all three
time points (i.e., three data points per case). Thus, athletes were grouped based on similarities in
their longitudinal experience over the course of the season. In the second stage, the longitudinal trajectories of the resulting clusters were then compared via profile analysis (also known as the multivariate approach to repeated measures ANOVA) to see if there were statistically significant differences between the groups over time. Finally, as the clusters were created based on the combined 4C’s measure, individual ANOVA’s were conducted for each C to explore potential differences between the groups for these more specific characteristics.

Once coach and athlete behaviour were coded within the Noldus Observer software, behavioural data were exported to the Gridware program (Version 1.1: Lamey, Hollenstein, Lewis, & Granic 2004), a free software package designed for state space grid methodology (Hollenstein 2007; Lewis, Lamey, & Douglas, 1999). State space grids (SSG’s; see Appendix E) are a dynamic systems-based method for visually representing and quantitatively analyzing real time behavioural data for multiple interacting agents (i.e., coach and athlete, in this case) simultaneously. By tracking both the behaviours constituting an interaction and the interaction’s trajectory through real time (e.g., over the course of a training session), SSG’s allow the analysis of both traditional measures of behavior (e.g., behaviour frequency counts) as well as more structural (i.e., temporal and interactive) behavioural qualities. The analytical flexibility of SSG’s has been highlighted as particularly useful in the study of coach-athlete interactions and, while a relatively new methodology, several previous coaching studies have employed them successfully (see Erickson & Côté, 2013; Erickson, Côté, Hollenstein, & Deakin, 2011; Turnnidge, Côté, Hollenstein, & Deakin, in press).

Within Gridware, behavioural data were calculated and analyzed for each of the 55 coach-athlete dyads separately. For example, a team with one coach and ten athletes results in ten unique coach-athlete dyads. The interaction profile for each dyad was calculated with respect
to only those coach behaviours directed explicitly at that particular athlete or to the team as a whole (which included the athlete in question), as well as that athlete’s behaviour toward the coach. Thus, the resulting interaction profile captured the unique interactive experience of each athlete with their coach over the course of a training session. Dyadic data was then averaged across observed sessions for each dyad and grouped according to athlete cluster membership and compared for possible differences between clusters using univariate ANOVA’s.

For the purposes of the present study, two general behavioural characteristics were analyzed for the dyads in each cluster: 1) coaches’ use of motivational tone, and 3) athlete interactive behaviour directed at the coach. Coaches’ use of motivational tone was first examined in terms of each of the tone categories independently, then explored in follow-up comparisons examining use of the tones in combination and with the behavioural content codes through which they were expressed. The relative utilization of motivational tones was assessed with respect to the mean duration (in seconds) of expression per training session for dyads within each cluster. Athlete interactive behaviour directed at the coach was similarly assessed with respect to the mean duration (in seconds) of expression per training session.

Results

Analysis of 4C’s Data

Data screening. Initial screening of the 4C’s data for all athletes at all three time points revealed no significant violations of normality; both skewness and kurtosis falling within acceptable ranges for all variables. While no data points fell outside the typical cut-off of 3.29 standard deviations from the mean (Tabachnick & Fidell, 2007) on any variable, four extreme values were identified as potential univariate outliers. These potential univariate outliers were dealt with independently in each analysis, depending on the robustness or susceptibility to
outliers of each particular statistical technique (see specific discussion of each analysis below). Based on calculation of Mahalanobis distances, no multivariate outliers were identified. There were a number of instances of missing data, primarily for total cases at particular time points which represent an athlete being absent from training the day of data collection. Only approximately two to three athletes from a given team were typically absent at any data collection time, corresponding to 156 complete data sets (i.e., full 4C’s measures at a particular time point) of a possible 165. Again, missing data were dealt with on an analysis-by-analysis basis, depending on the assumptions of each particular statistical technique.

**Cluster analysis.** A K-means cluster analysis was performed using the combined 4C’s measure for each athlete at the three time points, from which a three cluster solution emerged as the most statistically optimal and parsimoniously interpretable grouping (Everitt, Landau, Leese, & Stahl, 2011). While a range of two to six cluster solutions were generated, the three cluster solution was chosen as it maximized the Euclidean distance between cluster centers at each time point (in this case, >3 units between all cluster pairings) while minimizing within-cluster Euclidian distances from the cluster centre at each time point (in this case, <2 units for all cases). The season-long trajectories of the combined 4C’s measure for all cases are presented by cluster in Figure 1. Based on examination of the shape and temporal trend of the trajectories within each cluster, the first cluster \((n = 23)\) was labelled “High and Increasing” (HI), the second cluster \((n = 13)\) was labelled “Low and Decreasing” (LD), and the third cluster \((n = 19)\) was labelled “Moderate and Maintaining” (MM). All three clusters contained at least two athletes from each of the five participating teams, with the exception of the LD cluster which did not contain any athletes from the U15 girls’ team. See Table 1 for means and standard deviations for each cluster.
at the three time points. This three cluster solution was also confirmed with a follow-up hierarchical cluster analysis (Everitt et al, 2011), though these results are not presented.
Figure 1. Season-long trajectories on combined 4C’s measure for all cases, grouped by cluster.
All cases were included in the $K$-means cluster analysis, regardless of missing data, as this analysis is robust to missing data and will group cases based on any available data points. Since $K$-means cluster analysis can be susceptible to undue influence from outliers, the analysis was run both with and without the four identified potential univariate outliers. When run with the potential outlier data points removed pair-wise (i.e., the cases in question were retained, minus the extreme data points), the same three cluster solution emerged and only one case was reclassified from the MM cluster to the HI cluster. Examination of the raw data trajectory for the reclassified case supported this new classification.

**Profile analysis.** Following the cluster analysis, the resulting three clusters were compared via profile analysis (also known as the multivariate approach to repeated measures ANOVA) to see if longitudinal trajectories of the combined 4C’s measure differed between clusters. All profile analyses and associated follow-up contrasts were conducted using SPSS’s GLM program. As profile analysis can be extremely sensitive to outliers, the four identified potential univariate outlier points were removed from the data set. As profile analysis in SPSS GLM will only analyze complete cases, values for missing data were imputed using the procedure recommended by Tabachnick and Fidell (2007, pg. 345) for repeated measures designs which takes into account the commensurate nature of longitudinal data by incorporating the mean of known values for the specific case, the group mean for the specific time point, and the overall group mean. The analyses were run on both the original data set and the data set with missing values imputed, producing equivalent conclusions. As such, only the results of the higher powered analyses with the missing values imputed are presented here.
Table 1

*Descriptive statistics by cluster on combined 4C’s measure.*

<table>
<thead>
<tr>
<th></th>
<th>Time 1 M (SD)</th>
<th>Time 2 M (SD)</th>
<th>Time 3 M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1 “High and increasing”</td>
<td>14.39 (.109)</td>
<td>14.87 (.90)</td>
<td>14.95 (.83)</td>
</tr>
<tr>
<td>Cluster 2 “Low and decreasing”</td>
<td>11.92 (.79)</td>
<td>10.80 (1.06)</td>
<td>10.63 (.84)</td>
</tr>
<tr>
<td>Cluster 3 “Moderate and maintaining”</td>
<td>13.28 (.62)</td>
<td>12.96 (.65)</td>
<td>13.08 (.90)</td>
</tr>
</tbody>
</table>

A significant main effect was found for the levels test ($F(2, 52) = 128.06, p < .001$, partial $\eta^2 = .83$), indicating a difference between groups across all time points. Planned pair-wise Tukey HSD contrasts revealed significant differences between the estimated marginal means of each cluster for all comparisons (i.e., 1-2, 1-3, 2-3) at $p < .001$ (HI cluster EMM = 14.76, $SE = .14$; LD cluster EMM = 11.01, $SE = .19$; MM cluster EMM = 13.12, $SE = .16$). A significant main effect was also found for parallelism (Wilks’ criterion $F(4, 102) = 10.73, p < .001$, partial $\eta^2 = .30$), indicating a difference in the shape of the average longitudinal trajectory of the clusters over the course of the season. This deviation from parallelism was explored with post-hoc simple-effects analyses consisting of within-subjects ANOVA’s for each cluster separately (testing for differential effects of time, as recommended by Tabachnick & Fidell, 2007), including planned polynomial contrasts. These post-hoc simple-effects analyses for the HI cluster revealed a significant main effect for time (Wilks’ criterion $F(2, 21) = 4.06, p = .032$, partial $\eta^2 = .28$) and a significant linear contrast ($F(1, 22) = 8.47, p = .008$, partial $\eta^2 = .28$) while the quadratic contrast was not significant, indicating a significant linear upward trend from the
beginning to the end of the season. For the LD cluster, the main effect for time was also significant (Wilks’ criterion $F(2, 11) = 45.11, p < .001$, partial $\eta^2 = .89$) as was the linear contrast ($F(1, 12) = 10.35, p < .001$, partial $\eta^2 = .87$) while the quadratic contrast was again not significant, indicating a significant linear downward trend from the beginning to the end of the season. For the MM cluster, there was no significant effect for time, indicating a flat or unchanging trajectory over the course of the season.

**Cluster characteristics.** Given that the cluster analysis and profile analysis of the resulting clusters was conducted with the combined 4C’s measure, comparisons between clusters on each of the 4C’s independently using four separate ANOVA’s were conducted to better understand the particular characteristics of each cluster. In particular, we sought to examine whether one or several of the C’s were contributing more heavily to the differentiation of the clusters than others. As the levels effects was significant in the preceding profile analysis, these ANOVA’s were run on the mean score for each C for each participant (i.e., averaged across the three time points) in order to simplify interpretation.

Even with a Bonferroni-corrected alpha value of .0125, the omnibus ANOVA tests revealed significant differences between the clusters on each of the 4C’s (*Competence* - $F(2, 52) = 8.38, p = .001$, partial $\eta^2 = .24$; *Confidence* - $F(2, 52) = 16.07, p < .001$, partial $\eta^2 = .38$; *Connection* - $F(2, 52) = 36.64, p < .001$, partial $\eta^2 = .59$; *Character* - $F(2, 52) = 10.33, p < .001$, partial $\eta^2 = .28$). Planned pair-wise Tukey HSD contrasts were then used to compare scores between each cluster. See Figure 2 for means on each C within each cluster, with significant differences in cluster mean compared to both other clusters (e.g.,
Figure 2. Cluster means on each C. Asterisks indicate significant differences from both other clusters at \( p \leq .0125 \).

1-2 and 1-3, etc.) highlighted with an asterisk above the particular C score. Additional significant differences between individual clusters are highlighted below. Overall, athletes from the HI cluster reported significantly higher levels of competence, confidence, and character than the athletes of both other clusters and also scored higher than athletes from the LD cluster on connection (\( p < .001 \)). Athletes from the LD cluster reported significantly lower levels of confidence and connection than both other clusters and also scored lower than athletes from the HI cluster on competence (\( p = .001 \)) and character (\( p < .001 \)). Athletes in the MM cluster scored lower than the HI cluster on competence (\( p = .025 \)), confidence, and character (\( p = .023 \)) and also scored higher than
the LD cluster on confidence and connection \((p < .001)\). The difference between the HI cluster and the MM cluster on connection was not significant, nor was the difference between the LD cluster and the MM cluster on both competence and character.

**Behavioural Data**

*Data screening.* Screening of the primary tone dimensions (from which all subsequent component scores were derived) found no significant deviations from normality. Three data points exceeding the typical cut-off of 3.29 standard deviations from the mean (Tabachnick & Fidell, 2007) were classified as outliers and subsequently excluded from analysis; one within the mastery dimension and two within the personal rapport dimension. All athletes who had completed the 4C’s questionnaire were also observed at that same training session, so all athletes included in the cluster classification had complete behavioural data based on at least one observed training session. All behavioural data was then analyzed with respect to comparisons between the three clusters.

*Coaches’ Use of Motivational Tone.* With respect to the frequency of coaches’ overall utilization of the different motivational tones, athletes across all clusters experienced more controlling interactions \((M = 187.34, SD = 89.96)\) than autonomy-supportive \((M = 31.72, SD = 8.93)\), more mastery-oriented interactions \((M = 90.69, SD = 59.55)\) than ego-oriented \((M = 9.15, SD = 4.33)\), and more non-sport interactions characterized by general rapport \((M = 12.63, SD = 6.01)\) than personal rapport \((M = 1.77, SD = 2.18)\). See Appendix F for frequency table of all content and tone dimension occurrence across all clusters.
In the most general comparison between clusters, there were differences on both the mean duration per training session of overall interaction from the coach, including both individualized and full team-directed interactions \((F(2, 52) = 4.04, p = .023, \text{partial } \eta^2 = .14)\), and the mean duration per training session of individualized interaction from the coach directed at the specific athlete \((F(2, 52) = 4.91, p = .011, \text{partial } \eta^2 = .16)\).

Based on planned pair-wise Tukey HSD post-hoc contrasts, athletes in the LD cluster received significantly more overall coach interaction \((M = 2259.31 \text{ sec}, \ SD = 554.14, p = .025)\) than athletes in the HI cluster \((M = 1860.66 \text{ sec}, \ SD = 328.72)\), with a trend toward longer mean duration than the MM cluster \((M = 1893.02 \text{ sec}, \ SD = 435.86, p = .051)\).

Athletes in the LD cluster also received significantly more individualized coach interaction \((M = 145.87 \text{ sec}, \ SD = 100.78, p = .008)\) than athletes in the MM cluster \((M = 74.28 \text{ sec}, \ SD = 49.36)\).

Initial comparison between clusters on the basic motivational tone dimensions independently across all behaviours (with a Bonferroni-corrected alpha value set at .0125) found differences on the mean duration per training session in which athletes experienced controlling interaction \((F(2, 52) = 5.11, p = .009, \text{partial } \eta^2 = .16)\) and mastery-oriented interaction \((F(2, 51) = 5.97, p = .005, \text{partial } \eta^2 = .19)\) from the coach.

Planned pair-wise Tukey HSD post-hoc contrasts revealed that athletes in the LD cluster were the target of significantly more controlling \((M = 1448.74 \text{ sec}, \ SD = 571.16, p = .007)\) and mastery-oriented \((M = 665.75 \text{ sec}, \ SD = 265.87, p = .003)\) interaction than athletes in the HI cluster (controlling \(M = 938.90 \text{ sec}, \ SD = 368.41\); mastery \(M = 424.84 \text{ sec}, \ SD = 152.44\)). A significant difference was also found for the mean duration per training session for general rapport \((F(2, 52) = 7.41, p = .001, \text{partial } \eta^2 = .22)\). Athletes
in the HI cluster experienced more non-sport communication characterized by general rapport \((M = 110.51 \text{ sec}, \ SD = 53.55)\) than athletes in either the LD cluster \((M = 62.66 \text{ sec}, \ SD = 22.68, \ p = .004)\) or the MM cluster \((M = 71.02, \ SD = 32.46, \ p = .009)\). No significant differences between clusters were found for autonomy-support, either of the two neutral tones, or personal rapport independently.

Based on the significant findings for the duration of controlling and mastery-oriented tone dimensions in the initial comparisons, follow-up comparisons were conducted on the mean duration of all possible two dimensional combinations that included controlling or mastery elements. Significant differences were found for the mastery plus autonomy-supportive combination \((F(2, 51) = 6.24, \ p = .004, \text{ partial } \eta^2 = .20)\) as well as a trend towards significance for the mastery plus controlling combination \((F(2, 51) = 4.74, \ p = .016, \text{ partial } \eta^2 = .16)\). Planned pair-wise Tukey HSD post-hoc contrasts revealed that athletes in the LD cluster were exposed to longer mean durations of both the mastery plus autonomy-supportive combination \((M = 210.83 \text{ sec}, \ SD = 61.15, \ p = .004)\) and the mastery plus controlling combination \((M = 446.52 \text{ sec}, \ SD = 222.83, \ p = .010)\) than athletes from the HI cluster (mastery plus autonomy-supportive \(M = 143.92 \text{ sec}, \ SD = 52.83\); mastery plus controlling \(M = 264.89 \text{ sec}, \ SD = 127.86\)). No significant differences were found for the controlling plus ego-oriented combination.

Finally, as a further follow-up to the initial mastery and controlling tone dimension findings, the clusters were compared with respect to the mean duration of each dimension as expressed through the different possible behaviour content codes. These comparisons found significant differences on positive evaluation/encouragement with a mastery-oriented tone \((F(2, 51) = 5.35, \ p = .008, \text{ partial } \eta^2 = .17)\) and discussion of
mental skills with a controlling tone ($F(2, 52) = 4.83, p = .012, \text{partial } \eta^2 = .16$). Planned pair-wise Tukey HSD post-hoc contrasts revealed that athletes in the LD cluster were exposed to longer mean durations of both mastery-oriented positive evaluation/encouragement ($M = 87.38 \text{ sec, SD} = 46.28, p = .005$) and controlling discussion of mental skills ($M = 19.07 \text{ sec, SD} = 7.48, p = .008$) than athletes in the HI cluster (mastery-oriented positive evaluation/encouragement $M = 41.60 \text{ sec, SD} = 36.95$; controlling discussion of mental skills $M = 11.17 \text{ sec, SD} = 6.82$). Additionally, though they did not meet the stringent alpha cut-off set for the present analyses, trends towards differences on discussion of mental skills with mastery-oriented tone ($F(2, 51) = 4.38, p = .018, \text{partial } \eta^2 = .15$) and negative evaluation with a mastery-oriented tone ($F(2, 51) = 3.16, p = .051, \text{partial } \eta^2 = .11$) were also noted. Again, mean scores of athletes in the LD cluster were higher for both mastery-oriented discussion of mental skills ($M = 21.85 \text{ sec, SD} = 5.76, p = .014$) and mastery-oriented negative evaluation ($M = 9.15 \text{ sec, SD} = 6.11, p = .042$) than those of athletes in the HI cluster (mastery-oriented discussion of mental skills $M = 13.67 \text{ sec, SD} = 9.17$; mastery-oriented negative evaluation $M = 4.93 \text{ sec, SD} = 3.53$). No significant differences were found for any other behaviour content codes with either mastery or controlling tone.

**Athlete Behaviour.** Athletes’ utilization of the different coach-directed interaction categories was then compared between clusters. A significant difference was found for the mean duration athletes spent talking with the coach in a controlled manner ($F(2, 52) = 4.49, p = .016, \text{partial } \eta^2 = .15$). Planned pair-wise Tukey HSD post-hoc contrasts revealed that this difference was located between higher mean scores for the LD cluster ($M = 15.13 \text{ sec, SD} = 18.04, p = .012$) than the MM cluster ($M = 4.12 \text{ sec, SD} = 4.91$).
No significant differences were noted for any of the other athlete behaviour categories or for overall amount of athlete interaction.

**Discussion**

This study sought to examine the influence of coaches’ use of different motivational tones in their interactive behaviour on athletes’ developmental trajectories. Results revealed the presence of three distinct clusters of athletes representing different developmental trajectories from the beginning to the end of the season. The first cluster contained athletes who had initially high levels of all 4C’s and increased over the course of the season (HI). The second cluster contained athletes who had initially low levels of all C’s and decreased over the course of the season (LD). The final cluster contained athletes who had initially moderate levels of all C’s and did not change (MM).

Behavioural data analyzed for each coach-athlete dyad separately showed that athletes in the LD cluster received the highest amount of interaction from the coach, including individualized interaction directed at them specifically. This extra interaction was primarily mastery-oriented (i.e., focused on effort, learning, and the process of skill execution) and controlling (i.e., situating the coach as the final authority), expressed largely through positive evaluation/encouragement and discussion of mental skills. These athletes also spent more time interacting with the coach in a controlled manner, whereby the “correct” answer is known and held by the coach rather than collectively negotiated within the dyad. In contrast, athletes in the HI cluster experienced significantly more general interaction from the coach related to matters outside of sport. Similar to their 4C’s scores, athletes in the MM cluster did not receive uniquely differentiating scores on any behavioural dimension.
Results for the LD cluster suggest that coaches were giving extra attention to these athletes who were rated as the lowest in skill from the beginning of the season. Perhaps surprisingly, given the negative trajectory, this additional interaction often took what might be considered positive or facilitative forms with respect to both tone and content (e.g., individualized mastery-oriented positive evaluation/encouragement and discussion of mental skills; Becker, 2012; Roberts, 2012). These behaviours were also often controlling in tone, but this was not accompanied by any less autonomy-supportive behaviour than received by athletes in the other clusters. It appears the extra attention from the coach, targeted to performance-related matters, may actually have served to reinforce these athletes’ perceptions of being less skilled than their teammates and negatively influenced the full breadth of their developmental experience. Despite what may have been the best of helping intentions, these efforts seemed to have had a paradoxically strengthening effect on the athletes’ negative developmental trajectories over time. This is not to suggest that mastery-oriented interactions are somehow harmful, only that perhaps – given adequate baseline levels – more of a good thing may not always be better. These conclusions might be considered in line with findings from the motor learning and skill acquisition domain. Summarized very superficially, researchers in that field have found that increased or excessive external feedback can often be harmful to learning and performance outcomes (Schmidt & Wrisberg, 2008) and has been posited to work through both learning and motivational channels (Lewthwaite & Wulf, 2012). The present study highlights how this general effect may not be limited purely to skill acquisition but may also influence the entire psychosocial development experience in sport, particularly in team settings where differences in coach interaction between
individuals may be readily apparent to athletes. In addition to further exploring this association, future work might also seek to identify the beliefs and cognitions leading coaches to adapt their interaction patterns in this manner. The work of Solomon and colleagues (e.g., Solomon & Buscombe, 2012) on coaches’ expectancy effects, whereby coaches’ beliefs about an athletes’ ability or potential can influence the coaches’ behaviour toward that athlete which in turn influences the athletes’ experience, may be a fruitful framework to guide future research as well as an additional, potentially explanatory mechanism.

Results for athletes in the HI cluster offer indirect support for the significant body of research highlighting the critically important role of positive interpersonal relationships with adults on youth development, both in sport (e.g., Petitpas, Cornelius, Van Raalte, 2008) and in the general psychology literature (e.g., Lerner, 2002). The significantly higher levels of interaction these athletes received from their coach about matters beyond their immediate sport performance context gives the impression of a more comfortable interactive relationship, where they are treated as more than just an athlete. If true, such a conclusion is directly in keeping with current positive youth development in sport literature (e.g., Holt, 2008). Athletes in the MM cluster, on the other hand, while not experiencing the extra mastery-oriented and controlling interaction of the LD cluster, also did not appear to benefit from the extra general non-sport communication afforded to the HI cluster. While obviously no direct causal claims can be made, it is interesting to note that this middle-ground interaction profile was reflected in their developmental trajectories over the course of the season.
Overall, the present study offers several implications for both theory and future research. Foremost, the results provide support for the notion of motivational tone in coaches’ interactive behaviour as a differentiating factor in athlete development. More specifically, these findings contribute to two bodies of literature: first, the direct observation of behavioural manifestations of motivational tone may provide additional and unique information beyond general perceptions for motivation-related research and second, the addition of motivational tone helps to broaden the scope of coach behaviour research beyond instructional or pedagogical content to encompass more nuanced behavioural quality dimensions. Future research might look to address other tonal dimensions of coach behaviour, such as affective or emotional valence (Potrac, Jones, Purdy, Nelson & Marshal, 2012) or the use of humour (Ronglan & Aggerholm, 2012). Additionally, the distinct clusters with unique interaction profiles identified in the present study offer further validation for the utility of the 4C’s framework as representative developmental outcomes in youth sport, capable of capturing and differentiating athlete development over time. Finally, the person-centred approach employed in the analysis of both 4C’s (via cluster analysis) and behavioural data (via dyadic analysis with SSG’s) offers unique benefits to the study of coaching and athlete development by allowing more direct access to the individualized experiences and developmental trajectories of each athlete.

These implications should be considered in light of the limitations inherent to the study. While large with respect to the depth of individualized dyadic analysis of observational data, the sample size was too small to permit more complicated statistical analyses such as hierarchical linear modelling which may have been better able to
account for possible group level effects. As well, the sample included both male and female participants but was again too small to permit gender comparisons for either coaches or athletes. The sample also included teams across multiple age groups; however, all athletes were adolescents and this range is consistent with much previous research in youth sport (e.g., Coatsworth & Conroy, 2006).

In sum, the present study on motivational tone lends insight into “how” coaches interact with their athletes, beyond simply “what” they say. The results suggest that even with typically beneficial motivational tone, the relative amount of interaction in relation to other athletes maybe critical to its effectiveness. Further, this study supports the importance of not limiting coach-athlete interactions to purely sport-related matters and communicating with young people as more than just athletes. It is hoped these findings can be of use to both future research and the real-world promotion of positive athlete development.

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References


CHAPTER 5

An exploratory examination of interpersonal interactions between peers in informal sport play contexts
Abstract
Athlete-driven informal sport play represents an important context for athlete development (Côté, Baker & Abernethy, 2007). However, little is known about the interpersonal processes driving youth development in this context. The present study was an exploratory descriptive analysis of the interactive peer behaviours occurring in an informal sport play setting and their relationship to athlete development outcomes. Thirty young athletes participating in informal mixed-age volleyball, soccer, and basketball sessions at a community recreation centre were observed and their interactive behaviour coded. Participants also completed measures of athlete development. Results pointed to the social nature of participation in informal sport play contexts and the critical relationship between athlete competence and peer interaction tendencies. This study presents an initial exploration of informal sport play contexts, but continued future research is needed to better understand the developmental processes and implications of participation in this important contexts.
An exploratory examination of interpersonal interactions between peers in informal sport play contexts

Sport, often considered a single homogenous activity, actually takes place in many different forms and settings. The different characteristics of these forms and settings create the larger context for athletes’ sport experiences (Côté, Erickson, & Abernethy, 2013). In turn, these context-dependent experiences potentially influence the outcomes athletes accrue from their participation in a given sport setting. A primary characteristic of any sport context is the interpersonal interaction occurring within it, as constrained by the organizational structure of the activity. Most previous research on interpersonal interactions in sport has focused on formal, organized sport contexts led by a coach. In contrast, informal athlete-driven contexts have received relatively little attention. This study offers an exploratory first look at the interpersonal interactions occurring in informal sport contexts and their relationship to young athletes’ developmental outcomes.

The idea that different sport contexts might differentially contribute to athlete development was first addressed by Côté (1999) in a retrospective study of the developmental activities of elite athletes. The results of this study suggested that elite athletes often participated not only in highly structured training and competition in their younger years, but also high levels of more informal, less structured sport play with friends (e.g., street hockey, backyard soccer). Termed deliberate play, the recognition that these types of sport contexts may play an important role in sport talent development led to the creation of the Developmental Model of Sport Participation (DMSP: Côté, 1999; Côté, Baker & Abernethy, 2007). The DMSP posits that both organized and informal (i.e., deliberate play) activities offer unique contributions to athlete development and participation in a range of informal play-type sport activities provides a
foundation for both future talent development and recreational participation (Côté & Fraser-Thomas, 2011). Work based on the DMSP has linked increased participation in these informal sport play contexts to both the acquisition of sport expertise in adulthood (e.g., Berry, Abernethy, & Côté, 2008; Memmert, Baker, & Bertsch, 2010) as well as positive youth development outcomes (e.g., Fraser-Thomas, Côté, & Deakin, 2008).

Informal sport play activities are differentiated from more organized sport activities on a number of dimensions (Côté et al, 2013). For example, participation in informal sport play activities is by nature intrinsically motivated and focused on maximizing enjoyment of the present experience rather than long-term performance improvement. While organized sport activities can certainly be intrinsically motivating, there is often a conscious focus on performance or the progressive development of sport skills planned and led by a coach. Of particular importance, informal sport play activities are governed by the participants themselves, with minimal external direction (e.g., coaching). This self-governance means that participants organize the form and structure of the activity as they see fit, with the flexibility to adapt and negotiate rules or objectives to fit the constraints of the group or the setting. Finally, while organized sport activities are typically age-segregated, informal sport play activities often occur in mixed-age groupings with a corresponding variety of skill levels and physical abilities (Balish & Côté, 2013).

These qualities of informal sport play create a unique context for social and interpersonal processes. The significant influence of social interaction on human development has been noted extensively in the general developmental psychology literature (see Lerner, 2002; 2004). Indeed, the kinds of interactions and degree of social participation occurring within a given setting have been posited as key differentiators of developmental contexts (Goodnow, 2001). Within sport
research, examination of these critical processes has been conducted almost exclusively in organized sport contexts. Accordingly, interactions between coaches and athletes has received by far the most research attention (see Cushion, 2010; Horn, 2008), with interactions between peers studied to a comparatively lesser degree (Smith, 2003). By definition lacking a coach, interactions between peers are the dominant (and only) interpersonal interactions occurring in informal sport play contexts. Without a coach guiding the activity, peers in informal sport play contexts also have the added responsibility of negotiating the form and structure of their participation through their interactions. Further differentiating peer interactions in informal sport play contexts from those in organized sport contexts are the often mixed age and ability characteristics of informal sport play activities. Thus, while peers in organized sport contexts are typically similar in age and general ability (though variability obviously exists to some degree), young people in informal sport play contexts are often interacting with peers representing a much wider variation in age and ability levels.

Rubin, Bukowski, and Parker (2006) suggest that peer experiences can be understood at three different levels of complexity: interactions, relationships, and groups. Within the smaller body of literature on peers in sport, considerably more emphasis has been placed on the relationship and group levels (Smith, 2007) and very few studies have directly observed the interactive behaviours of peers (Bruner, Eys, & Turnnidge, 2013). Thus we currently know very little about the behavioural interactions between peers in sport and the work that has been conducted at the behavioural level has been situated in organized sport contexts (e.g., d'Arripe-Longueville, Gemigon, Huet, Winnykamen, & Cadopi, 2002). To our knowledge, no studies have examined peer interactions in informal sport play contexts.
In attempting to understand the influence of peer interactions in informal play contexts on athlete development, we must not only build a clearer picture of the types and qualities of behavioural interactions occurring in this context but also begin to link these interactions to athletes’ developmental outcomes. To this end, there is a growing body of knowledge based on the DMSP related to the influence of participation in different sport contexts on long-term athlete development (Côté et al, 2007) and, though relatively sparse at the behavioural level, the significant influence of peers on athletes’ psychosocial experiences in sport (e.g., friendships, motivation, moral development) is receiving increased research attention (Smith, 2007; Weiss & Stuntz, 2004). However, a theoretically-guided outcome framework capable of linking these two bodies of literature with respect to peer interactions in informal sport play contexts is needed. Further, this framework must be comprehensive enough to capture the many facets of athlete development that may be influenced by peer interactions in informal sport play contexts, while at the same time sensitive enough to discriminate between athletes with different participation experiences within the same context.

One possible framework is the 4C’s of athlete development as described by Côté and colleagues (Côté, Bruner, Erickson, Strachan, & Fraser-Thomas, 2010; Côté & Gilbert, 2009). Encompassing competence, confidence, connection, and character, the 4C’s are based on the 5C’s of positive youth development framework developed by Lerner and colleagues (Lerner, 2004; Lerner et al, 2005; Roth & Brooks-Gunn, 2003) in general developmental psychology. Reflecting the conceptual overlap between character and the original fifth C – caring/compassion – in the sport psychology literature, these last C’s were collapsed in transitioning the framework to sport research. When used to assess athlete development, competence refers to typical notions of sport skill or talent, confidence refers to general perceptions of self-worth and efficacy within
the sport domain, connection refers to positive bonds with other people in the sport context, and character refers to both moral development and empathic/compassionate understanding of others. In combination, the 4C’s represent the full spectrum of positive developmental outcomes associated with sport participation and have successfully discriminated between athletes on different longitudinal development trajectories (Erickson & Côté, in preparation [study 2]).

Thus, the purpose of the present research was to provide an initial exploratory and descriptive analysis of peer interactive behaviour in informal sport play contexts. More specifically, the present study examined the relationship between these peer interactive behaviours in informal sport play contexts and athlete development outcomes as defined by the 4C’s framework.

Methods

Participants

Participants for the present study were athletes aged 25 and younger who participated in all-ages informal drop-in volleyball, basketball, or indoor soccer sessions at a community recreation centre in a mid-sized Canadian city. Of the 68 athletes (age range = 15-49) who agreed to participate, 44 were within the targeted age range. Of these, only the final sample of 30 participants had analyzable questionnaire and behavioural data. Mean age of the final sample was 19.84 (SD = 2.40), including 21 males (70%) and 9 females (30%). All study procedures were approved by the general research ethics review board at the researchers’ home university and by the community recreation centre’s executive prior to the initiation of data collection. Informed consent was granted in writing by all participants.

Procedure
Prior to data collection, the lead author attended two weeks’ worth of drop-in recreation sessions (one session per sport, per week) at the community recreation centre in order to distribute information regarding the study and discuss procedures and timeline with participants. Over the following three week period, eight informal drop-in recreational sport sessions were observed and video-recorded (three volleyball sessions, three indoor soccer sessions, and two basketball sessions). Each observed session was recorded on video with two separate HD camcorders, both taking a wide-angle perspective from opposite ends of the gymnasium in an attempt to capture the entire setting. To record audio of the session, each camcorder was linked to a shotgun microphone. The two video and audio streams were then time synchronized and combined into a single split-screen video file for each session. At the beginning of each session, all athletes were asked if they would like to participate in the full data collection for the study. Consenting participants completed a questionnaire packet measuring the 4C’s (competence, confidence, connection, and character), as well as provided identifying information (i.e., hair colour, shirt colour) so they could be identified in the video recording of the session. As not all individuals attending the drop-in sessions were 25 or younger or consented to full data collection, only fully consenting participants aged 25 and younger were analyzed from the video recordings. If consenting participants attended more than one session, they only completed the questionnaire packet once and their behaviour was analyzed only from the videotape for the corresponding session.

**Measures**

**Behavioural observation.** Behavioural data for athletes was collected via systematic observation of the videotapes of recorded sessions by an independent coder not involved in the study design. The observational data coding was conducted in a continuous manner for each
participant, resulting in a stream of time series data where the activation of a particular code also indicated the end of the previous code for that participant. Continuous coding therefore allows the calculation of both the frequency and duration of behaviours. All behavioural coding was conducted with Noldus Observer software (Version 9: Noldus, Trienes, Hendricksen, Jansen, & Jansen, 2000).

Given the exploratory nature of the present study and logistical difficulties inherent to recording athletes’ verbalizations in a scattered, informal setting at a level that allows observers to clearly hear what all athletes are saying, a rudimentary coding system was developed for the collection of interactive behaviour data. This coding system was based on previous observational coding systems designed for peer interactive behaviour both within sport (e.g., Le Couteur & Feo, 2011; Vierimaa, 2012) and developmental psychology (Dishion, Crosby, Rusby, Shane, Patterson, & Baker, 1989; Rusby, Estes, & Dishion, 1991), adapted to the constraints of the current data collection. Athletes’ interactive behaviour was classified within two general categories: private and public. The private category refers to interactive behaviours intended only for those directly involved in the interaction and was subdivided into two specific codes: 1) interaction with a single individual, and 2) interaction in a group of two or more other individuals. Due to the inherently quieter nature of these interactions, specific content could not be reliably distinguished on the video recording and thus was not coded. The public category refers to interactive behaviours intended for the larger group as a whole (even if directed at a specific individual – e.g., making fun of an individual for the amusement of the larger group) and was subdivided into three specific codes: 1) organizational (e.g., selecting teams, collectively negotiating which teams play or sit out next) 2) sport performance-related (e.g., directing teammates where to go during game play, publicly criticizing or congratulating a teammate), and
3) general (e.g., non-sport related joking). Inter-rater reliability was assessed through comparison of a short segment of video coded independently by both the primary coder and the first author, with 91% agreement between the two. Further, both the primary coder and the first author independently coded a variety of separate clips intentionally compiled to include a wide range of different athlete behaviours, scoring 100% agreement.

**Athlete outcomes.** Athlete outcomes focused on measurement of the 4C’s – competence, confidence, connection, and character. The specific battery of measures chosen was based on the extensive review and recommendations of Vierimaa, Erickson, Côté, and Gilbert (2012) in their work on measurement of the 4C’s in youth sport contexts. While an initial study of the psychometric properties of the original 5C’s model (Jones, Dunn, Holt, Sullivan, & Bloom, 2011) failed to find support for a five factor model, the items used were taken from the original non-sport measurement battery and may not have adequately captured the unique qualities of sport participation contexts (e.g., competence conceptualized as academic achievement rather than sport skill). Vierimaa and colleagues (2012) argued that the measurement of positive youth development in sport needs to be tailored specifically to the sport domain and, accordingly, the measurement framework used for the present study consists of questionnaires and assessment strategies designed and previously validated with youth sport athletes. Competence was assessed through self-ratings from the athletes, while connection between peers was assessed through a sociometric nomination procedure. Athletes’ confidence and character were both measured through psychometrically validated self-report questionnaires. For ratings of all C’s, athletes were instructed to refer only to their current informal sport context.

Athletes’ competence was measured using the Sport Competence Inventory developed by Vierimaa and colleagues (2012), based on the work of Causgrove, Dunn, and Bayduza (2007). In
the Sport Competence Inventory, sport competence is conceptualized as consisting of three elements: technical skill, tactical skill, and physical skill. Each of these three elements was self-rated by each athlete on a 5-point Likert-type scale ranging from ‘Not at all competent’ to ‘Extremely competent’. Thus, the final competence score for each athlete is calculated as the average of the ratings across all three elements. For the present sample, Cronbach’s alpha assessing internal reliability was .88.

Confidence was measured using the self-confidence subscale of the Revised Competitive State Anxiety-2 (CSAI-2R: Cox, Martens, & Russell, 2003). The self-confidence subscale is made up of 5 items (e.g., ‘I’m confident I can meet the challenge’) that are scored on a 4-point Likert-type scale ranging from ‘Not at all’ to ‘Very much so’. As the original version of the CSAI-2R targeted state confidence, the instructions were modified for the present study in line with the recommendations of Vierimaa and colleagues (2012) to target trait sport confidence instead (i.e., “indicate how you generally feel” rather than “indicate how you feel right now”). The CSAI-2R has been validated with two independent samples of athletes and a confirmatory factor analysis revealed that the self-confidence subscale demonstrates good psychometric properties with standardized path coefficients of .69 to .80 (Cox et al, 2003). For the present sample, Cronbach’s alpha assessing internal reliability was .94.

Connection was measured via the Peer Connection Inventory developed by Vierimaa and colleagues (2012), employing a sociometric nomination approach whereby each athlete nominated the three peers they enjoyed participating with in this particular sport environment the most and the three peers they enjoyed participating with the least. Athletes were assured of the confidentiality of their nomination of their peers. Unfortunately, initial examination of raw data supplied for the peer nomination assessment of connection revealed that many participants were
unable to complete full nominations as they did not know the names of most of the other participants. The connection measure was therefore excluded from further analysis.

Character was measured by the Prosocial and Antisocial Behavior in Sport Scale (PABSS: Kavussanu & Boardley, 2009). The PABSS is a 20-item questionnaire assessing how often athletes engage in specific prosocial and antisocial behaviours during the current season on a 5-point Likert-type scale. Both the prosocial and antisocial dimensions can be further broken down into behaviours directed toward teammates and behaviour directed toward opponents. Each of these four subscales has shown good internal reliability in previous research (Cranbach’s alphas = .74 - .86; Kavussanu & Boardley, 2009). Within the present study, the larger prosocial and antisocial dimensions were of most interest, with an overall character score calculated for each athlete as their score on the prosocial dimension minus their score on the antisocial dimension. For the present sample, Cronbach’s alpha assessing internal reliability was .78 for the prosocial dimension and .76 for the antisocial dimension.

Data Analysis

All statistical analyses were conducted with SPSS software (version 21). Given the small sample size and resulting need to limit the number of variables analyzed, behaviour in each category was represented by only the total duration in seconds across the entire observed sport session for which each category was coded as active. After initial data screening, descriptive statistics and bivariate correlations between the three remaining C’s (competence, confidence, and character) and all behavioural variables were calculated. Three separate standard multiple regressions were then run, using the duration spent expressing each of the five actively communicative behaviours as predictors of competence, confidence, and character respectively. Standard rather than hierarchical multiple regressions were used as there was no theoretical basis
to prioritize any of the behavioural variables, given the exploratory nature of the present study.

Despite the multiple analyses, a Bonferroni correction was not applied to the critical alpha value as a number of authors (e.g., Nakagawa, 2004) have argued that such a correction unnecessarily and unproductively reduces power in exploratory phase research with small sample sizes.

**Results**

Initial screening of all variables used in analysis revealed no univariate or multivariate (as assessed by Mahalanobis distance) outliers. All behavioural variables were moderately positively

| Table 1 |
|---|---|---|---|---|
| **Measures** | **Mean** | **SD** | **Min** | **Max** |
| Competence (out of 5) | 3.47 | .94 | 1.00 | 5.00 |
| Confidence (out of 4) | 3.28 | .66 | 2.00 | 4.00 |
| Character (out of 5) | 1.55 | .74 | -.20 | 3.04 |
| Private – Individual (sec) | 157.26 | 165.54 | 7.04 | 626.42 |
| Private – Group (sec) | 50.91 | 78.12 | .00 | 297.99 |
| Public – General (sec) | 10.17 | 21.20 | .00 | 105.61 |
| Public – Organization (sec) | 12.34 | 27.17 | .00 | 147.05 |
| Public – Sport (sec) | 1.50 | 2.64 | .00 | 12.15 |

*Note.* All behavior variables measured as total duration (seconds) over the observed session. Character measure calculated as prosocial score minus antisocial score (both out of 5). Skewed and were subsequently transformed with a square root transformation prior to analysis. Transformation brought all variables to acceptably normal distributions. Two cases had not
completed the items assessing character and were excluded pair-wise on an analysis-by-analysis basis. Inter-correlations between the behavioural predictor variables were within acceptable ranges and variance inflation factor (VIF) scores were all less than two, suggesting the absence of multicollinearity.

Descriptive statistics for all variables used in analyses are presented in Table 1. Note in particular the relatively small mean total durations for the entire sample for the two explicitly sport-related behaviours (Public – Organization and Public – Sport) in relation to the remaining,

Table 2

<table>
<thead>
<tr>
<th>Measures</th>
<th>1</th>
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<td>1. Competence</td>
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<tr>
<td>2. Confidence</td>
<td>.80**</td>
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<tr>
<td>3. Character</td>
<td>.14</td>
<td>.03</td>
<td>---</td>
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<tr>
<td>4. Private – Individual</td>
<td>-.02</td>
<td>.00</td>
<td>-.01</td>
<td>---</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5. Private – Group</td>
<td>.28</td>
<td>.17</td>
<td>-.07</td>
<td>.54**</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Public – Organization</td>
<td>.56**</td>
<td>.42*</td>
<td>-.06</td>
<td>.45*</td>
<td>.41*</td>
<td>.48**</td>
<td>---</td>
</tr>
<tr>
<td>8. Public – Sport</td>
<td>.22</td>
<td>.11</td>
<td>-.26</td>
<td>.37*</td>
<td>.44*</td>
<td>.39*</td>
<td>.54**</td>
</tr>
</tbody>
</table>

*Note.*  *p < .05, **p < .01*

potentially more general, social interaction behaviours. Pearson’s *r* correlations between all variables are reported in Table 2. Significant correlations were noted between competence and
Collectively, the total durations spent using the five interactive behaviours significantly predicted competence scores \( F(5,24) = 4.23, p = .007 \), accounting for slightly more than a third of the total variance in competence \( R^2 = .47 \), adjusted \( R^2 = .36 \). Individually, duration of public organizational interaction was the strongest predictor \( \beta = .69, p = .002, sr^2 \text{ unique} = .28 \), while duration of private interaction with a single individual was a significant negative predictor \( \beta = -.49, p = .020, sr^2 \text{ unique} = .05 \). None of the remaining three behavioural variables were significant independent predictors (private interaction with group - \( \beta = .31, \text{ ns} \); public general interaction - \( \beta = .10, \text{ ns} \); public sport-related interaction - \( \beta = -.15, \text{ ns} \)). Neither of the regression models using the behaviour variables to predict confidence or character was significant.

**Discussion**

The present study represents an initial research foray into the interpersonal interactions occurring in informal sport play contexts. This exploratory analysis of context-specific peer interactions examined the association between the relative expression of different interactive behaviours and young people’s developmental outcomes. Simple examination of means for the entire sample suggested that participants typically spent more time engaging in potentially general social interaction behaviours than they did engaging in explicitly sport-related behaviours. The results from the regression analyses suggest that the primary link between interactive behaviours and athlete developmental outcomes was centred around athletes’ self-perceptions of competence (which is highly correlated with confidence, as would be expected conceptually). In particular, there appeared to be a relatively strong positive association between competence and engaging in public organizational behaviours – in other words, taking an active
role in how the shared activity was to be structured and run. A negative association was also reported between competence and private interaction with single individuals, whereby individuals with lower perceptions of competence were more likely to interact in the least public manner possible. These findings, in addition to examination of the descriptive statistics for the behavioural variables, lend support to the idea that a variety of different peer interaction patterns exist within these informal sport play contexts. Further, the significant variance accounted for by the combination of all five behavioural variables and the significant moderate correlations between most of the behavioural variables opens the possibility of distinct interaction profiles representing individual tendencies across the different interactive behaviour types.

Considered in light of the intrinsically motivated nature of informal sport play and the lack of long-term performance objectives, the preliminary observation that athletes spent more time in potentially general interaction than sport-related interaction supports previous research emphasizing the largely social motivation of youth sport participation (e.g., Allan, 2003; Scanlan, Carpenter, Lobel, & Simons, 1993; Weiss, 1993). From a theoretical perspective, self-determination theory (Deci & Ryan, 2002) posits that relatedness (i.e., positive social connections) is a basic human need, satisfaction of which contributes to more intrinsically motivated behaviour, and has been used extensively in the study and promotion of sport participation (Ntoumanis, 2012). Given their essentially social nature, informal sport play contexts might then be a particularly relevant avenue for future sport participation and physical activity promotion efforts.

The primary contribution of competence to peer experience in sport is well supported in the previous literature on peers (Smith, 2003; 2007). For example, physical competence has been strongly linked to social acceptance (e.g., Weiss & Duncan, 1992). The present study expands on
these findings and offers initial insight into the specific manifestation of this influence in informal sport play contexts. The athlete-driven characteristics of these contexts, where there is no coach to set the activity structure and participants themselves therefore assume this responsibility, provide unique opportunities for different interactions to emerge. Based on these initial findings, perceived competence may be the differentiating factor in terms of which athletes step into the void to fill these central roles. The growing body of literature on athlete leadership (Loughead, Hardy, & Eys, 2006), while again primarily situated in organized sport contexts currently, may be particularly relevant in guiding future research in this area. Work on the role of communication in athlete leadership (e.g., Hardy, Eys, & Loughead, 2008) presents a possible link between the study of peer interactions at the behavioural level with this broader area of research.

Overall, this exploratory study provides a first look at the interactive behaviours occurring in informal sport play contexts, as well as a first systematic observation of the inner workings of these unique contexts. While studies of peer interactions in developmental psychology are occasionally criticized as being ‘contaminated’ by particular environmental/contextual influences and thus clouding the basic processes of interest (Rubin, et al, 2006), in the present study, the context-specificity of these interactions was the central focus of interest. With this focus, the present study opens the door to linkages between the macro-level research concerning the influence of participation in different sport contexts on athlete development (e.g., Côté et al, 2007) and the existing research on peers in sport that has primarily addressed organized sport contexts (e.g., Smith, 2007; Wiess & Stuntz, 2004).

However, a number of limitations to the present study should be considered. Based on the cross-sectional nature of the present study, no assumptions of causal direction could be made. In
fact, reciprocal causality is likely (Rubin et al., 2006; Smith, 2003), in that peer interactions may influence the course of athlete development but individuals’ current developmental status or characteristics will almost certainly also influence their interaction patterns with peers. The small sample size is an obvious limitation; however, it does reveal the realities of conducting field-based research in these informal sport play contexts. Even with the observation of eight different sessions, only approximately half to two thirds of the overall attending athletes consented to participate in the study. Of these 68, given the focus on young people for the present study, less than half were within even the broadened definition of youth as aged 25 and under and completed the study procedures. It is important to consider, though, that this does reflect the actual composition of these all-ages drop-in recreation sessions and informal sport play contexts more generally (Balish & Côté, 2013). In a similar vein, in contrast to organized sport settings with set participant rosters who are all aware of one another, the unpredictable attendance of these sessions meant that competence was necessarily based purely on a self-rating (as opposed to the triangulated ratings of coaches and peers outlined by Vierimaa and colleagues, 2012) and the connection measure was unusable for analysis.

In looking to address these limitations, future research is encouraged to employ longitudinal designs, allowing for more insight into the direction of causality as well as the assessment of additional levels of complexity in the peer experience (e.g., the upward effects of peer interactions on other peer-related factors, such as friendships, social acceptance, social roles, and group dynamics). Additionally, as the present study represents a relatively superficial analysis of interactive behaviour, future research might look to incorporate more truly interactive qualities of peer behaviour (i.e., dynamic and reciprocal; Murphy-Mills, Bruner, Erickson, & Côté, 2011). Even with the general category of informal sport play, there may be further
contextual differences. For example, there may be different interaction patterns within self-selected groups (i.e., street hockey organized by a group of friends) compared to the public drop-in recreation setting of the present study. Finally, while the future study of informal sport play contexts has the potential to contribute valuable new insight to several bodies of literature, researchers are advised to consider the unique methodological and logistical challenges of these contexts. In contrast to organized sport contexts which are typically advertised in the public domain, the very nature of their informality makes specific settings difficult to even locate. And while organized sport settings are often routinely observed by parents and members of the public, informal play settings require particular consideration in order to not unduly interrupt the natural flow of participation.

ACKNOWLEDGEMENTS

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References


CHAPTER 6: General Discussion

The overall intent of the present program of research was to examine the predominant interpersonal interactions occurring in two different youth sport contexts: coach-driven organized sport and athlete-driven informal sport play. Interpersonal interactions were examined with respect to their context-specific relationships with athlete development outcomes as conceptualized by the 4C’s framework. In conducting this examination, interpersonal interactions in both contexts were systematically observed in real-world sport settings, capturing the in situ interactional experiences of participants.

Examining the coach-driven organized sport context, studies 1 and 2 attempted to push the leading edge of coach behaviour research. Through the development and validation of a new observation system targeted at the theoretically relevant but previously unexplored motivational tone dimension of coaches’ interactive behaviour, study 1 opened the door to new questions aimed at ‘how’ coaches interact with athletes, beyond simply ‘what’ they say. The behavioural operationalization of coaches’ motivational tone was intended to help bridge the gap between the strong theory-driven literature based on athletes’ perceptions of their sport experience (e.g., Ntoumanis, 2012; Roberts, 2012) and the large body of observational research on coach behaviour (Cushion, 2010; Smith & Smoll, 2007). Study 2 then used this new observational coding system to conduct a season-length longitudinal study of coach-athlete interaction and athlete development. The person-centred approach employed in this study offered an in-depth look at the unique interactional experiences of individual athletes and how these experiences influenced their developmental trajectory. Results of study 2 suggest that athlete developmental status at the beginning of the season may influence coaches’ interactive behaviour and this differential interactive experience (i.e., more mastery-oriented performance-related interaction...
directed at low scoring athletes and more non-performance-related interaction directed at high scoring athletes) may reinforce and perpetuate athletes’ positive or negative developmental trajectories.

Study 3 presents an initial description of the interactive behaviours athletes display toward their peers. This first snapshot highlighted the potential for the structural characteristics of sport contexts (i.e., athlete-driven vs. coach-driven) to shape the interpersonal processes occurring within them. In doing so, it is hoped that the results of this exploratory study will provide a foundation for more detailed future research in informal sport play contexts. In particular, the results of study 3 point to the potentially fruitful examination of the link between athlete competence and different social and leadership roles within informal sport groups (e.g., Loughead, Hardy, & Eys, 2006). This study also provided an opportunity to identify and explore the unique methodological issues and challenges associated with conducting research in informal sport play contexts.

Taken together, the three studies comprising this program of research offer support for Goodnow’s (2001) contention that developmental contexts can be differentiated based on the types of interpersonal interactions and degrees of social participation that occur within them. In line with Goodnow’s theorizing, the results of the present studies suggest that context-specific features may facilitate and constrain particular interaction patterns, and that this facilitation and constraint may exhibit context-specific relationships with athletes’ developmental status and trajectories. A more in-depth understanding of the contextualized interpersonal processes influencing athlete development also contributes to and moves forward the Developmental Model of Sport Participation (DMSP: Côté, 1999; Côté, Baker & Abernethy, 2007). While much previous research has established the benefits of participation in both organized sport and
informal sport play contexts for talent and positive psychosocial development during youth (Côté et al, 2007), the mechanisms through which these benefits are accrued in each context have not yet been fully empirically established (Côté, Lidor, & Hackfort, 2009). The present research attempted to address this gap though a targeted investigation of interpersonal interaction processes in the distinct contexts defining the positive developmental pathways of the DMSP.

Across both studies 2 and 3, the social aspects of sport participation emerged as central to the athlete development process. This was particularly striking (and perhaps more expected) in the informal sport play context; however, even in the more competitively oriented organized sport context, the social meaning of coach-athlete interactions appeared to outweigh the skill acquisition functions in terms of their influence on athlete development. This conclusion suggests new hypotheses for DMSP-based research, particularly addressing the role of the sampling years in holistic athlete development. For instance, in addition to the motor skill development and motivational advantages of participation in multiple sport contexts, perhaps such sampling may also relate to exposure and participation in a diverse array of interpersonal relationships and interactions. As has been previously suggested (Côté et al., 2009), such diverse exposure may offer a protective effect against any one negative interactive environment – in effect increasing the odds of encountering a positive social development environment. This program of work also provided a context-specific validation of the 4C’s theoretical framework described by Côté, Bruner, Erickson, Strachan, and Fraser-Thomas (2010) and the measurement framework compiled by Vierimaa, Erickson, Côté, and Gilbert (2012). While offering strong support for its utility and discriminant validity in organized sport contexts (study 2), the measurement framework may require modification to achieve optimal practical utility in informal sport play contexts (study 3).
Beyond contributions to sport-situated developmental theory and research, the present results have practical implications for athlete development. By understanding how athletes’ developmental status appears to both influence and be influenced by their interpersonal interaction experiences in multiple contexts, we may be better able to structure sport participation pathways to better meet the needs of individual athletes and facilitate the range of positive athlete development outcomes. In organized sport contexts, this means improved coach education with regard to how coaches interact with the different athletes on their teams. In particular, coaches should work to be aware of the meaning athletes take from their interactions. Coaching behaviours appear to be neither good nor bad in isolation; rather, the implied message related to the athlete’s social role within the team environment may positively or negatively colour the final effect of a given behavioural pattern. Thus coaches must ensure they are not unintentionally isolating certain athletes in their efforts to aid in skill acquisition or, on the other hand, withholding meaningful non-sport interaction from a particular subgroup of their athletes.

In informal sport play contexts, implications of the present findings refer to the degree to which the relative provision and accessibility of sport play spaces and settings offers equal opportunities for all to experience positive social participation experiences.

Methodologically, there were a number of challenges associated with the present program of research. In utilizing a field-based observational approach to the examination of the different sport contexts, studies 2 and 3 were able to access the unique real-world interactional experiences of athletes. However, the collection of this data was constrained (and rightly so) by the need to adapt to the idiosyncrasies of each setting so as to interfere as little as possible in either the training sessions observed in study 2 or participation opportunities in study 3. We were imposing on the participants’ limited recreational time and while they were extremely gracious
in allowing us access, research aims necessarily and ethically had to take lower priority than the effective and functional running of each session. For instance, camera angles and microphone positioning were often less than optimal, with the result of limiting the detail in which particular behaviours could be coded. The informal sport play setting in particular presented a host of unexpected challenges and provided a significant learning experience on the trials of field-based research.

Ultimately, the goal of this program of work was to produce innovative research that has the potential to both contribute to the leading edge of our academic knowledge base and enable positive real-world change for individuals, sport and youth organizations, and communities. By combining a positive youth development perspective (e.g., Lerner, 2002) with a context-specific examination of youth sport participation, the present research demonstrated the potential, but not inevitability, for youth sport to positively influence youth development. Working toward this end, the results offered new information to further our understanding of interpersonal interactions and athlete development but also identified a number of avenues where much future research is needed. It is hoped the present work can provide a foundation for future developments in both the practical and research dimensions of athlete development and increase the contribution of sport participation to positive athlete development overall.
References for General Introduction, Literature Review, and General Discussion


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Appendix A
# Coding System Structure

**DIMENSION OVERVIEW – Coach Behaviour**

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<th>Content</th>
<th>Autonomy Support</th>
<th>Evaluation Climate</th>
<th>Rapport</th>
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<tr>
<td>1 - Organization</td>
<td>1 - Autonomy-supportive</td>
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<td></td>
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<tr>
<td></td>
<td>2 – Neutral</td>
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<td></td>
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<tr>
<td></td>
<td>3 – Controlling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 - Instruction/Feedback</td>
<td>1 - Autonomy-supportive</td>
<td>4 – Mastery-oriented</td>
<td></td>
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<tr>
<td></td>
<td>2 – Neutral</td>
<td>5 – Neutral</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 – Controlling</td>
<td>6 – Ego-oriented</td>
<td></td>
</tr>
<tr>
<td>3 - Positive Evaluation/Encouragement</td>
<td>1 - Autonomy-supportive</td>
<td>4 – Mastery-oriented</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – Neutral</td>
<td>5 – Neutral</td>
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<tr>
<td></td>
<td>3 – Controlling</td>
<td>6 – Ego-oriented</td>
<td></td>
</tr>
<tr>
<td>4 - Negative Evaluation</td>
<td>1 - Autonomy-supportive</td>
<td>4 – Mastery-oriented</td>
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<td>2 – Neutral</td>
<td>5 – Neutral</td>
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<tr>
<td></td>
<td>3 – Controlling</td>
<td>6 – Ego-oriented</td>
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<tr>
<td>5 - Mental Skills</td>
<td>1 - Autonomy-supportive</td>
<td>4 – Mastery-oriented</td>
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<td>5 – Neutral</td>
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<tr>
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<td>3 – Controlling</td>
<td>6 – Ego-oriented</td>
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<td>1 - Autonomy-supportive</td>
<td>4 – Mastery-oriented</td>
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<td>3 – Controlling</td>
<td>6 – Ego-oriented</td>
<td></td>
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<td>7 – Non-sport Communication</td>
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<td>7 – Personal</td>
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<td>8 – General</td>
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<td>8 - Observation</td>
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<tr>
<td>9 - Not Engaged</td>
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<tr>
<td>x - Uncodable</td>
<td></td>
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</tbody>
</table>
General Coding Guidelines

Overview
The Assessment of Coaching Tone (ACT) coding system was developed for observations of coaches in a sport environment. This coding manual is intended for observation of primarily practice/training time, but can be used for competitions as well.

Rules

- 3-second rule
  - Wait three (3) seconds before coding ‘observation’ (coach behaviour tone) when changing from any actively communicative code. Code for this behaviour only if it continues past the three (3) second waiting period. If within three (3) seconds a different actively communicative behaviour occurs, do not wait to code that behaviour.
  
  - Wait three (3) seconds before coding ‘uncodable’ (coach behaviour tone) when changing from any other code. Code for this behaviour only if it continues past the three (3) second waiting period. If within three (3) seconds a different behaviour visibly or audibly occurs, do not wait to code that behaviour.

- Default codes
  - For coach behaviour tone, specific behaviour codes are to be coded by default if criteria for any other behaviour within the dimension are not met. That is, use the default code in the absence of any other codable behaviour:
    - (behaviour) – ‘observation’
Dimension – Coach Behaviour

Overview
The coach behaviour dimension is comprised of basic content codes and three (3) classes of tone modifier codes.

Each interactive content code (i.e., all content codes other than ‘observation’ and ‘not engaged’) is linked to one (1) or two (2) specific classes of tone modifier codes. For each observed interactive coach behaviour, a content code and a tone modifier code from each associated class MUST be scored. Thus, each observed behaviour is categorized by the combination of two (2) or three (3) codes – a content code followed by modifier code(s) (e.g., “Instruction/Feedback + Autonomy-supportive + Mastery-oriented” or “Organization + Controlling”, etc.)

If there is a change in any of these codes (content OR tone modifier), begin a new entry and code as new independent coach behaviour. Thus, if the coach begins with “Instruction/Feedback + Autonomy-supportive + Mastery-oriented” and moves immediately to “Instruction/Feedback + Controlling + Ego-oriented” in the same continuous interaction, code as two (2) separate behaviours.

CONTENT CODES

1 – Organization: Communication from coach related to organization of practice tasks and athlete actions, NOT intended to directly influence performance.
   Notes
   • E.g., “now we’re doing ____ drill”, “go over there”, “do 10 of these”, etc.
   • Includes discipline, keeping control, etc.
   • Includes timing or counting during skill execution/drills
   • CANNOT include any technical instruction related to movement quality (code 2) or motivational encouragement (code 3). Code for each separately, even if these behaviours occur in immediate sequence.
   Associated Tone Modifier Class(es) – must also code
   • Autonomy

2 – Instruction/Feedback: Technical and/or tactical and/or teaching instruction or feedback from coach, directed at athlete(s) motor performance or skill execution.
   Notes
   • MUST include prescriptive/corrective technical information in reference to the quality of the movement or skill execution (e.g., how it should be performed, what could be improved, etc.)
   Associated Tone Modifier Class(es) – must also code
   • Autonomy
   • Motivational Climate
3 – **Positive Evaluation/Encouragement (verbal and non-verbal):** Positive reaction or motivational encouragement from coach directed at athlete(s) motor performance or skill execution.

**Notes**
- Can be verbal (e.g., “good job”, etc.) or non-verbal (e.g., thumbs up, high five, etc.).
- If non-verbal, must be very obvious communication.
- Can be directed at desirable performance (e.g., “way to go!”), mistake (e.g., “don’t worry about it”), or future performance (e.g., “you can do it!”, “lets go guys!”).
- **CANNOT** include any technical instruction related to movement quality (code 2)

**Associated Tone Modifier Class(es) – must also code**
- Autonomy
- Motivational Climate

4 – **Negative Evaluation:** Non-technical negative reaction by coach to an undesirable motor performance or skill execution by athlete(s).

**Notes**
- Must include an evaluative word or implied meaning
- Verbal (e.g., “that was terrible”, sarcasm, etc.).
- Non-verbal (e.g., shaking head, etc.).
- If non-verbal, must be very obvious communication.
- **CANNOT** include any technical instruction related to movement quality (code 2)

**Associated Tone Modifier Class(es) – must also code**
- Autonomy
- Motivational Climate

5 – **Mental Skills:** Communication from coach related to individual mental/psychological skills, characteristics, qualities, or aspects of performance.

**Notes**
- Can be directed at general psychological topics related to performance (e.g., confidence, focus, mental toughness, etc.)
- Can be directed at specific strategies to improve psychology of performance (e.g., imagery, self-talk, goal-setting, etc.)

**Associated Tone Modifier Class(es) – must also code**
- Autonomy
- Motivational Climate

6 – **Social or Moral Behaviour:** Communication from coach related to inter- and intra-personal behaviour and conduct, NOT directed toward performance enhancement.

**Notes**
- Can include general social or moral topics (e.g., respect, support, empathy/understanding, representing the team, etc.)
- Can include encouragement of peer coaching/helping (athletes providing feedback or instruction to peers)
- **CANNOT** include performance-specific topics (e.g., team coordination to run a specific tactical manoeuvre, etc.)
Associated Tone Modifier Class(es) – must also code
- Autonomy
- Motivational Climate

7 – Non-sport communication: Communication from coach not directly related to task, performance, or personal development in the current team/training/performance context.
Notes
- E.g., joking with athletes, talking about school, etc.

Associated Tone Modifier Class(es) – must also code
- Autonomy
- Rapport

8 – Observation: Coach engaged in observing/watching athletes during training/performance activities, though not directly communicating with athletes.
Notes
- Default code if coach is engaged in training/competition activities but criteria not met for any actively communicative code.
- 3-second rule in effect before coding for ‘observation’ from an actively communicative code.

No Associated Tone Modifier Class

9 – Not engaged: Coach not engaged in training/competition activities directed at athletes and not directly communicating with athletes.
Notes
- E.g., talking to other coaches (even if talking about practice-related content), adjusting music, etc.
- High threshold to code ‘Not engaged’

No Associated Tone Modifier Class

x – Uncodable
Notes
- To be coded if coach is out of view with no verbal communication detected or microphone cuts out.
- 3-second rule in effect before coding for ‘uncodable’.

No Associated Tone Modifier Class
**TONE MODIFIER CODES**

**Autonomy**

*Possible Preceding Content Codes*
- Organization
- Instruction/Feedback
- Positive Evaluation/Encouragement
- Negative Evaluation
- Discussion of Mental Skills
- Discussion of Social or Moral Behaviour
- Non-sport Communication

1 - **Autonomy-supportive**: Conveys view of athlete(s) as capable decision makers and contributing members of the situation.

   **Notes**
   - Provision of choice
   - Soliciting of athlete opinion(s)
   - Questioning (must expect/allow an answer reflecting athlete input)
   - Acknowledgement of athlete feelings/perspectives
   - Provision of rationale/justification for decisions
   - Encouragement of creativity, risk taking, or independent problem solving
   - Acknowledgement of individual role/contribution

2 – **Neutral**: Absence of autonomy-related tone.

   **Notes**
   - Only code if no criteria from any other category is met (e.g., “good”)
   - If in doubt, code as ‘neutral’ (high threshold for ‘autonomy-supportive’ and ‘controlling’).

3 – **Controlling**: Verbal statement conveying an autocratic tone, with coach as total decision maker.

   **Notes**
   - Indicates NO athlete input, consultation, or acknowledgement of athlete(s) perspective
   - Typically directive statements, where coach has already made decision
   - Can reflect current activities or coach-driven *expectations* for future behaviour (e.g., ‘should’ or ‘must’ or equivalent statements)
   - **CAN** be positive statements (e.g., “I want you to keep that up next game”)

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Motivational Climate

Possible Preceding Content Codes

- Instruction/Feedback
- Positive Evaluation/Encouragement
- Negative Evaluation
- Discussion of Mental Skills
- Discussion of Social or Moral Behaviour

4 - Mastery-oriented: Verbal instruction or feedback that is self (individual athlete)-referenced OR focused on the process of skill execution

Notes
- Discussion of improvement relative to own past performance (self-referenced - e.g., “that was much better than yesterday”)
- Process, rather than outcome, based feedback (e.g., “good follow-through on that one!” – even if the shot was missed; note that reference to effort is also considered process-based feedback)
- If both self-referenced AND outcome-based content is expressed (e.g., “you made more shots that time”), prioritize the self-referenced aspect and code as ‘mastery-oriented’

5 – Neutral: Absence of motivational climate-related tone.

Notes
- Only code if no criteria from any other category is met (e.g., “good”)
- If in doubt, code as ‘neutral’ (high threshold for ‘mastery-oriented’ and ‘ego-oriented’).

6 - Ego-oriented: Verbal instruction or feedback that is other (comparative)-referenced or focused on the outcome of skill execution

Notes
- Discussion of relative ability in comparison to teammates/opponents (e.g., “nice work beating that defender!”)
- Outcome, rather than process, based feedback (e.g., “Nice goal”)
- If both other-referenced AND process-based content is expressed (e.g., “that was the best follow-through on the team”), prioritize the other-referenced aspect and code as ‘ego-oriented’
Rapport

Possible Preceding Content Codes

- Non-sport Communication

7 – **Personal**: Verbal non-sport related communication from the coach making direct reference to personal information about the athlete.

**Notes**
- Personal information refers to athlete’s feelings, perspectives/opinions, life circumstances, or experiences outside of sport (i.e., school, family, relationships, etc.)
- Can take the form of a question, requesting personal information (e.g., “how was school today?”, “what do you think of that movie?”, etc.)
- Can also take the form of a statement, reflecting previous knowledge of athlete’s personal information (e.g., “I know you were feeling pretty low last week”, Congratulations on finishing exams!”, etc.)
- Can make reference to sports, as long as it does not have any reference to the athlete themselves or his/her team (e.g., talking about pro sports).

8 – **General**: Verbal non-sport related communication from the coach NOT making direct reference to personal information about the athlete.

**Notes**
- Default code if criteria for ‘personal’ not met
- CANNOT reference athlete’s feelings, perspectives/opinions, life circumstances, or experiences outside of sport (i.e., school, family, relationships, etc.)
PARTICIPANT PARENTAL LETTER OF INFORMATION AND CONSENT FORM

Title of the study: Examining Youth Development in Sport

We would like to ask for your son’s or daughter’s assistance with a study that is being carried out by a team of researchers from Queen’s University. The purpose of this study is to examine how youth develop personally through sport. The findings from this project will provide important information to coaches and educators in regard to promoting positive personal development in sport settings and beyond as contributing members of society. This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen’s policies.

If your son or your daughter volunteers to participate in this study, he/she may be asked to participate in two parts of the study. In Part I, participants will be asked to complete a questionnaire three times over the course of their season. The questionnaire asks questions about your son or daughter’s sport environment and their sport experiences. The questionnaire should take about 15 minutes to complete each time. Some of the questions on this questionnaire will ask your son or daughter to rate other members of their sport group regarding their skill ability and social status. In addition, this questionnaire will involve members of the sport group rating your son or daughter’s skill ability and social status. These ratings will be kept completely anonymous and will not be shown to the other athletes. They have the right to not answer any questions that they are uncomfortable with and they are invited to contact TeleHealth Ontario at 1-866-797-0000 if any of these questions trigger emotional upset.

Part II of the study will involve teams being observed at least three times over the course of their season. Multiple sessions within the sport setting will be videotaped. Coaches will wear a microphone to record any talking that takes place within the sport environment. The videotaped practices will then be watched by the researchers to understand the different coach-athlete interactions and peer interactions that occur within sport. Some athletes from these teams may be asked to provide their opinions of their coach’s actions while watching a short video segment of a session. These opinions will be kept completely anonymous and will not be shown to the coach.

There will be no deception used in this study. Participation is completely voluntary and your child will be informed that he/she can withdraw at any time. This is part of a research project for which Jean Côté is the primary researcher. The results from this study will be published and presented at conferences; however, the identity of your son or daughter will be kept confidential. All the information provided through the questionnaires and observations will be confidential and will be stored by in a locked office at Queen’s University for a minimum of seven years after the completion of the study. As a reminder, participation is completely voluntary and should you (or your son or daughter) wish, he/she may withdraw from all or part of the study at any time, for any reason, without explanation or consequences by
contacting the principal researcher, Dr. Jean Côté. Any information collected up to the time your son or daughter withdraws from the study will be destroyed.

With your permission and your son’s/daughter’s permission, the questionnaires and observations will be used to help improve young athlete development. If you and your son or daughter decides that he/she would like to be a part of this study, please complete the attached form. Also, please ask your son or daughter to read their letter and indicate his/her consent as well. Any questions about study participation may be directed to Dr. Jean Côté at 613-533-6000 x79049. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or 613-533-6081.

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Joan Stevenson, PhD  
*Chair*  
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Queen’s University  
Kingston, ON  
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stevensj@queensu.ca
PARENTS/GUARDIANS PLEASE READ and SIGN YOUR CONSENT

I have read and understood the purpose of this study and my son/daughter’s involvement in this study. I am aware that my son/daughter will remain anonymous throughout the study and in any written results of the data collection through participation in this project.

I understand that my son/daughter’s participation in this research project is completely voluntary and that he/she has the right to not answer any question(s) that he/she feels comfortable with. I also recognize that my son/daughter has the right to withdraw from the study at any time without penalty and that any data collected to this point will be destroyed.

Finally, any questions I have about this research project and my son/daughter’s participation have been answered to my satisfaction. I understand that I am invited to contact the primary researcher and/or the General Ethics Review Board should I have any further questions or concerns about this research project and my son/daughter’s participation.

I, ____________________________ give permission to allow ____________________________ to participate in the study conducted by the School of Kinesiology and Health Studies at Queen’s University.

Signature ____________________________ Date ______________

Please indicate if you wish to receive a summary of the study findings: [ ] Yes  [ ] No
PARTICIPANT CONSENT FORM-ATHLETE

You are invited to participate in a study entitled ‘Examining Youth Development in Sport’. This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen's policies. Please read this form carefully and feel free to ask any questions you may have.

Purpose and Procedures
The purpose of this research study is to examine the personal development of youth in sport. If you volunteer to participate in this study, you will be asked to complete questionnaires evaluating your personal experiences in sport. Some questions will ask you to rate other members of your sport group regarding their skill ability and social status. In addition, this questionnaire will involve members of your sport group rating your skill ability and social status. You will also be videotaped during your sport sessions.

Potential Risks
You have the right to not answer any questions that you are uncomfortable with and are invited to contact Telehealth Ontario at 1-866-797-0000 if any of these questions trigger emotional upset.

Potential Benefits
As a participant, you may be making important contributions to the research literature. We cannot and do not guarantee or promise that you will receive any direct benefits from the study.

Storage of Data
The original questionnaires and videotaped observations will be safeguarded and securely stored in a locked filing cabinet at Queen’s University for a minimum of seven years as per University requirements.

Confidentiality
The data from this study will be published and presented at conferences; however, your identity will be kept confidential.

Right to Withdraw
You may withdraw from the study for any reason, at any time, without penalty of any sort by contacting the principal investigator, Dr. Jean Côté (613-533-6000 x79049). There will be no team related effects associated with withdrawal. You do not have to answer any questions that you do not feel comfortable answering. Any information collected up to the time you withdraw from the study will be destroyed.

Questions
Any questions about study participation may be directed to Dr. Jean Côté at 613-533-6000 x79049. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or 613-533-6081.
Consent to Participate
I have read and understood the description provided above. I have been provided with an opportunity to ask questions and my questions have been answered satisfactorily. I consent to participate in the study described above, understanding that I may withdraw this consent at any time. A copy of this consent form has been given to me for my records.

_________________________  _______________________
Signature of Participant       Date

_________________________  _______________________
Signature of Researcher        Date
COACH LETTER OF INFORMATION AND CONSENT FORM

Title of the study: Examining Youth Development in Sport

The purpose of this study is to examine how different coach behaviours affect youth’s development in sport. Specifically, the goal is to understand how the different ways coaches interact with athletes during practices leads to athletes’ experiences in sport. This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen's policies.

The study will have each athlete complete a questionnaire related to his/her experience in this sport (i.e., on this specific team with this specific coach) at three time points over the course of your season. As a component of this questionnaire, you will be asked to rate your athletes’ level of competence in sport. Over the course of three-four months, multiple practices in that sport setting will then be videotaped. As a coach, you will be wearing a microphone to record any talking. The videotaped practices will then be watched by the principal investigator to understand the different coach-athlete interactions (i.e., patterns and sequences of coach/athlete interactions). Individual clips from the videos may also be used in a later part of the project. There are no known or foreseeable risks involved by participating in this study.

This is part of a research study for which Jean Côté is the primary researcher. Information collected from coaches will remain completely confidential. For the entire study, all information collected will be kept in a locked filing cabinet by the primary researcher. Items will be available to the primary researcher and his research team. As a reminder your participation in this study is completely voluntary and you can decide to stop participating at any point without explanation or consequences. Should you decide to withdraw from participation, information collected to that point will be destroyed. Although there is no financial compensation it is anticipated that your information will help us to better understand the positive developmental experiences of youth sport participation.

The study is only interested in the information collected for the entire group and so all participants’ individual responses will never be known, keeping individuals identity secure. While the information collected may be presented at academic conferences and published in relevant academic journals, anonymity and confidentiality of all participants will be maintained. Any questions about study participation may be directed to Dr. Jean Côté at 613-533-6000 x79049. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or 613-533-6081.

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PARTICIPANT CONSENT FORM - COACH

I have read the information letter and understand that this study requires the athletes I coach to complete a survey regarding their experiences in our specific sport setting (i.e., on this specific team, with me as a coach). I have been informed that I will be asked to assess the competence levels of my athletes. I also understand that the second part of this study involves the videotaping of multiple practices in order to examine interactions between coaches and athletes.

I have been informed that my confidentiality will be protected throughout the study, and that the information I provide will be available only to the primary researcher and his research team. While the results of this study may be presented at academic conferences and/or in academic journals, I am aware that any results will be presented for the group only (i.e., no individual data will ever be reported) – thereby maintaining my anonymity. Similarly, the videotaped practices will only be viewed by the primary researcher and/or his research team and only for the purpose of data analysis – they will never be shown at conferences or in any other presentation.

I understand that my participation in this research project is completely voluntary and that I reserve the right not to answer any question(s) I do not feel comfortable with. I also recognize that I may stop participating at any time without explanation or consequence. I understand that any data collected up to that point will be destroyed.

Finally, any questions I have about this research project and my participation have been answered to my satisfaction. I understand that I am invited to contact the primary researcher and/or the General Ethics Review Board should any further questions or concerns about this research project or my participation.

I consent to participate in this research project.

__________________________  ________________________  __________
Name of Participant                      Signature                      Date
Appendix C
PARTICIPANT PARENTAL LETTER OF INFORMATION AND CONSENT FORM

Title of the study: Examining Youth Development in Sport

We would like to ask for your son’s or daughter’s assistance with a study that is being carried out by a team of researchers from Queen’s University. The purpose of this study is to examine how youth develop personally through sport. The findings from this project will provide important information to coaches, sport programmers, and educators in regard to promoting positive personal development in sport settings and beyond as contributing members of society. This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen’s policies.

If your son or your daughter volunteers to participate in this study, he/she may be asked to participate in two parts of the study. In Part I, participants will be asked to complete a questionnaire three times over the course of their season. The questionnaire asks questions about your son or daughter’s sport environment and their sport experiences. The questionnaire should take about 15 minutes to complete each time. Some of the questions on this questionnaire will ask your son or daughter to rate other members of their sport group regarding their skill ability and social status. In addition, this questionnaire will involve members of the sport group rating your son or daughter’s skill ability and social status. These ratings will be kept completely anonymous and will not be shown to the other athletes. They have the right to not answer any questions that they are uncomfortable with and they are invited to contact TeleHealth Ontario at 1-866-797-0000 if any of these questions trigger emotional upset.

Part II of the study will involve teams being observed at least three times over the course of their season. Multiple sessions within the sport setting will be videotaped. The videotaped practices will then be watched by the researchers to understand the different peer interactions that occur within sport.

There will be no deception used in this study. Participation is completely voluntary and your child will be informed that he/she can withdraw at any time.

This is part of a research project for which Jean Côté is the primary researcher. The results from this study will be published and presented at conferences; however, the identity of your son or daughter will be kept confidential. All the information provided through the questionnaires and observations will be confidential and will be stored in a locked office at Queen’s University for a minimum of seven years after the completion of the study. As a reminder, participation is completely voluntary and should you (or your son or daughter) wish, he/she may withdraw from all or part of the study at any time, for any reason, without explanation or consequences by contacting the principal researcher, Dr. Jean Côté. Any information collected up to the time your son or daughter withdraws from the study will be destroyed.

With your permission and your son’s/daughter’s permission, the questionnaires and observations will be used to help improve young athlete development. If you and your son or daughter decides that he/she would like to be a part of this study, please complete the attached form. Also, please
ask your son or daughter to read their letter and indicate his/her consent as well. Any questions about study participation may be directed to Dr. Jean Côté at 613-533-6000 x79049. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or 613-533-6081.

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PARENTS/GUARDIANS PLEASE READ and SIGN YOUR Consent

I have read and understood the purpose of this study and my son’s/daughter’s involvement in this study. I am aware that my son/daughter will remain anonymous throughout the study and in any written results of the data collection through participation in this project.

I understand that my son/daughter’s participation in this research project is completely voluntary and that he/she has the right to not answer any question(s) that he/she feels comfortable with. I also recognize that my son/daughter has the right to withdraw from the study at any time without penalty and that any data collected to this point will be destroyed.

Finally, any questions I have about this research project and my son/daughter’s participation have been answered to my satisfaction. I understand that I am invited to contact the primary researcher and/or the General Ethics Review Board should I have any further questions or concerns about this research project and my son/daughter’s participation.

I, ____________________________ give permission to allow ____________________ to participate in the study conducted by the School of Kinesiology and Health Studies at Queen’s University.

Signature ____________________________ Date ____________________________

Please indicate if you wish to receive a summary of the study findings: [ ] Yes  [ ] No
PARTICIPANT CONSENT FORM-ATHLETE

You are invited to participate in a study entitled ‘Examining Youth Development in Sport’. This study has been granted clearance according to the recommended principles of Canadian ethics guidelines, and Queen's policies. Please read this form carefully and feel free to ask any questions you may have.

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Potential Risks
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Potential Benefits
As a participant, you may be making important contributions to the research literature. We cannot and do not guarantee or promise that you will receive any direct benefits from the study.

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Confidentiality
The data from this study will be published and presented at conferences; however, your identity will be kept confidential.

Right to Withdraw
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Questions
Any questions about study participation may be directed to Dr. Jean Côté at 613-533-6000 x79049. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or 613-533-6081.
Consent to Participate
I have read and understood the description provided above. I have been provided with an opportunity to ask questions and my questions have been answered satisfactorily. I consent to participate in the study described above, understanding that I may withdraw this consent at any time. A copy of this consent form has been given to me for my records.

_________________________  __________________________
Signature of Participant     Date

_________________________  __________________________
Signature of Researcher      Date
Appendix D
STUDY: Examining Youth Development in Sport

Current team: __________________________________________________________

Name: _____________________________         Today’s date: _________________

Birthdate (DD/MM/YYYY): ______________

Number of previous seasons played this sport (not including this year): _______

Number of previous seasons with current head coach (not including this year): _______
Athlete Sport Competence Inventory

Sport competence refers to one’s ability to successfully perform a certain task in sport. In this form you will be rating the sport competence of both yourself and your teammates in volleyball.

Please answer each question based on how skilled or competent you perceive yourself or your teammates in each of the areas listed compared to all of the athletes that you know. Please answer truthfully, basing your rating solely on the specific area described in each question.

Circle the number that best corresponds to your perceptions. A 5 represents the most competent athlete you know at your age/skill level, while a 1 represents the least competent athlete you know at your age/skill level. Please check the appropriate box when you reach the section where you are rating yourself.

Your answers will be kept completely confidential.

In this section, you will be evaluating  .

<table>
<thead>
<tr>
<th>Please rate this person’s sport competence in the following areas:</th>
<th>Not at all competent</th>
<th>Somewhat competent</th>
<th>Moderately competent</th>
<th>Very competent</th>
<th>Extremely competent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical skills (e.g., shooting, passing, blocking, etc.)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Tactical skills (e.g., decision-making, reading the play, strategy, etc.)</td>
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<td>5</td>
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</table>

**Sport Confidence Inventory**

A number of statements that athletes have used to describe their feelings in sport are given below. Read each statement and then circle the appropriate number to indicate how you generally feel while participating in your sport.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all competent</th>
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<th>Very competent</th>
<th>Extremely competent</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel self-confident.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>I’m confident I can meet the challenge.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>I’m confident about performing well.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>I’m confident because I mentally picture myself reaching my goal.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>I’m confident of coming through under pressure.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
**Coach-Athlete Relationship Questionnaire**

This questionnaire is designed to assess your relationship with your coach. Please answer truthfully. All answers will be kept completely confidential.

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel close to my coach</td>
<td>Not at all</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2. I feel committed to my coach</td>
<td>Not at all</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3. I feel that my sport career is promising with my coach</td>
<td>Not at all</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4. I like my coach</td>
<td>Not at all</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5. I trust my coach</td>
<td>Not at all</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6. I respect my coach</td>
<td>Not at all</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7. I feel appreciation for the sacrifices my coach has experienced in order to improve his/her performance</td>
<td>Not at all</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>8. When I am coached by my coach, I feel at ease</td>
<td>Not at all</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>9. When I am coached by my coach, I feel responsive to his/her efforts</td>
<td>Not at all</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>10. When I am coached by my coach, I am ready to do my best</td>
<td>Not at all</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>11. When I am coached by my coach, I adopt a friendly stance</td>
<td>Not at all</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
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Peer Connection Inventory

The following questionnaire will assess your relationships with your teammates in sport. Please answer each question based solely on the sport environment, excluding any contact outside of the team/group.

Please answer truthfully. Your answers will be kept completely confidential.

Please circle the 3 teammates that you enjoy participating in your sport with the most:

- Ali TenHove
- Brianna Davey
- Cassy Santoni
- Jelena Mancic
- Jenny Casson
- Kaitlyn Inalsingh
- Kayla Gibson
- Kerry Readwin
- Krissy Berndt
- Savy Black
- Mado Leblanc
- Sarah Bradshaw

Please circle the 3 teammates that you enjoy participating in your sport with the least:

- Ali TenHove
- Brianna Davey
- Cassy Santoni
- Jelena Mancic
- Jenny Casson
- Kaitlyn Inalsingh
- Kayla Gibson
- Kerry Readwin
- Krissy Berndt
- Savy Black
- Mado Leblanc
- Sarah Bradshaw
**Behavior in Sport Scale**

Below is a list of behaviours likely to occur during matches/games. Please think about your experiences while playing your sport and indicate **how often** you engaged in these behaviours this season by circling the relevant number. Please respond honestly.

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Gave positive feedback to a team-mate</td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
<td>Often</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>Criticized an opponent</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>Argued with a team-mate</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>Helped an opponent</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>1</td>
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<td>4</td>
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<tr>
<td>5.</td>
<td>Deliberately fouled an opponent</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>1</td>
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<td>4</td>
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<td>6.</td>
<td>Asked to stop play when an opponent was injured</td>
<td></td>
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<td>1</td>
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<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>Verbally abused a team-mate</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>1</td>
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<td>4</td>
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<tr>
<td>8.</td>
<td>Encouraged a team-mate</td>
<td></td>
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<td></td>
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<td>1</td>
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<td>4</td>
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<tr>
<td>9.</td>
<td>Retaliated after a bad foul</td>
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<td></td>
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<td>1</td>
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<td>4</td>
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<td>10.</td>
<td>Helped an injured opponent</td>
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<td>12.</td>
<td>Gave constructive feedback to a team-mate</td>
<td></td>
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<td>1</td>
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<tr>
<td>13.</td>
<td>Tried to wind up an opponent</td>
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<td>1</td>
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<tr>
<td>14.</td>
<td>Swore at a team-mate</td>
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<td>1</td>
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<tr>
<td>15.</td>
<td>Congratulated a team-mate for good play</td>
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<td>4</td>
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<tr>
<td>16.</td>
<td>Tried to injure an opponent</td>
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<td>1</td>
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<td>4</td>
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<tr>
<td>17.</td>
<td>Intentionally distracted an opponent</td>
<td></td>
<td></td>
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<td></td>
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<td>1</td>
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<td>4</td>
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<tr>
<td>18.</td>
<td>Showed frustration at a team-mate's poor play</td>
<td></td>
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<tr>
<td>19.</td>
<td>Intentionally broke the rules of the game</td>
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<td>3</td>
<td>4</td>
</tr>
<tr>
<td>20.</td>
<td>Physically intimidated an opponent</td>
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<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
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</tbody>
</table>
State space grids (SSG’s) are a dynamic systems-based method for visually representing and quantitatively analyzing real time behavioural data for multiple interacting agents (i.e., coach and athlete, in this case) simultaneously. By conceptualizing the total ‘state space’ for the dyadic interactions in question as defined by all possible behaviours for the coach along one axis and all possible behaviours for the athlete along the other, SSG’s are in effect a grid coordinate system. The ‘state’ of the behavioural interaction at any given moment is then located within this overall space according to its x- and y-coordinates – the coach and athlete’s simultaneously expressed behaviour. When either the coach’s or athlete’s behaviour (the x- or y-coordinate) changes, a new location within the state space is plotted and thus it is possible track both the behaviours constituting an interaction and the interaction’s trajectory through real time (e.g., over the course of a training session). Measures describing the trajectory can then be quantified. The above image is an actual state space grid from the present study, representing the interaction between one coach and a single athlete over the course of a 90 minute training session.
Table.

*Mean frequency of occurrence per training session (approximately 90 minutes in duration) for interactive content and tone dimensions across clusters.*

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Mean frequency per session</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content</strong></td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td>145.05</td>
</tr>
<tr>
<td>Instruction/Feedback</td>
<td>61.49</td>
</tr>
<tr>
<td>Positive Evaluation/Encouragement</td>
<td>59.87</td>
</tr>
<tr>
<td>Negative Evaluation</td>
<td>6.34</td>
</tr>
<tr>
<td>Mental Skills</td>
<td>2.36</td>
</tr>
<tr>
<td>Social/Moral Behaviour</td>
<td>.94</td>
</tr>
<tr>
<td>Non-sport Communication</td>
<td>14.40</td>
</tr>
<tr>
<td><strong>Motivational Tone</strong></td>
<td></td>
</tr>
<tr>
<td>Autonomy-supportive</td>
<td>31.72</td>
</tr>
<tr>
<td>AS Neutral</td>
<td>116.10</td>
</tr>
<tr>
<td>Controlling</td>
<td>187.34</td>
</tr>
<tr>
<td>Mastery</td>
<td>90.69</td>
</tr>
<tr>
<td>EC Neutral</td>
<td>61.91</td>
</tr>
<tr>
<td>Ego</td>
<td>9.15</td>
</tr>
<tr>
<td>Personal Non-sport Communication</td>
<td>1.77</td>
</tr>
<tr>
<td>General Non-sport Communication</td>
<td>12.63</td>
</tr>
</tbody>
</table>

*Note. AS Neutral = neutral code on autonomy support dimension. EC Neutral = neutral code on evaluation climate dimension.*