Sports coaches’ interpersonal motivating styles:
Longitudinal associations, change, and multidimensionality

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To A, B, & C with love
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Abstract
Coaches play a central role in shaping the sport environment for young athletes. This thesis is focused on the leadership process in sports and how coaches’ autonomy-supportive and controlling interpersonal styles longitudinally are related to young athletes’ motivation and ill- and well-being. The aim is also to examine psychometric multidimensionality in measures of coaches’ need-supportive and controlling interpersonal styles. Questionnaire data from young athletes were used in the empirical studies. In Study 1, we examined an adaptive motivational process (i.e., longitudinal associations between autonomy support, need satisfaction, self-determined motivation, and well-being). The results showed that within-person changes in perceived autonomy support, need satisfaction, self-determined motivation, and well-being were all positively correlated. Higher self-determined motivation and well-being early in the season longitudinally predicted higher levels of perceived autonomy support from the coach. In Study 2, we examined a maladaptive motivational process (i.e., longitudinal associations between coaches’ controlling behaviors, controlled motivation, and ill-being). The findings demonstrated that athletes who perceived their coach as more controlling reported higher controlled motivation at the end of the season and that higher controlled motivation early in the season predicted higher ill-being at the end of the season. Controlled motivation was also a positive predictor of athletes’ perceptions of coaches’ controlling behaviors at the within-person level. Study 1 and 2 suggest that individual factors (e.g., motivation and well-being) seemed to function as important determinants of how athletes perceived their coach and future research should explore the underlying mechanisms through which these processes occur. In Study 3, we examined psychometric multidimensionality in measures of athletes’ perceptions of coaches’ need-supportive (Interpersonal Supportiveness Scale-Coach [ISS-C]) and controlling (Controlling Coach Behaviors Scale [CCBS]) interpersonal styles. The analyses indicated that the ISS-C is not multidimensional; it appears to comprise a single factor. Three of the four subscales of the CCBS appear to share a common core, whereas the fourth subscale (i.e., controlling use of rewards) seems to represent a slightly different aspect of a controlling interpersonal style. These results bring into question the multidimensionality in measures of athletes’ perceptions of coaches’ interpersonal styles. Neither measure displayed a coherent multidimensional pattern, indicating a need for better alignment between theory and measurement.
List of Papers


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Abbreviations

BPNT  Basic psychological needs theory
CBAS  Coaching Behavior Assessment System
CCBS  Controlling Coach Behaviors Scale
CET   Cognitive evaluation theory
CETr  Coach effectiveness training
CLPM  Cross-lagged panel model
DIEM  Dynamic integrated evaluation model
ESEM  Exploratory structural equation modeling
FIML  Full information maximum likelihood
GLS   Generalized least squares
HCCQ  Health Care Climate Questionnaire
HMIEM Hierarchical model of intrinsic and extrinsic motivation
ICM-CFA Independent clusters model confirmatory factor analysis
ISS-C Interpersonal Supportiveness Scale—Coach
LDS   Latent difference score
LGCM  Latent growth curve modeling
LSS   Leadership Scale for Sports
MAC   Mastery approach to coaching
ML    Maximum likelihood
MLM   Multilevel modeling
MNAR  Missing not at random
OIT   Organismic integration theory
SDT   Self-determination theory
SEM   Structural equation modeling
SiGA  Secretory immunoglobulin A
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Introduction
This thesis is focused on the leadership process in sports and how coaches’ autonomy-supportive and controlling interpersonal styles longitudinally are related to young athletes’ motivation and ill- and well-being. Leadership can, however, be conceptualized in many ways. My definition stems from Northouse (2016): “Leadership is a process whereby an individual influences a group of individuals to achieve a common goal” (p. 6). Defining leadership as a process means that it is not a trait within the leader or a unidirectional influence from the leaders to the followers; a process implies a transactional event whereby the leader and followers are influencing each other. Many theories can be applied to understand the leadership process in sports, ranging from traditional leadership theories, such as the multidimensional model of leadership (Chelladurai, 1990) and transformational leadership theory (Bass, 1985; Bass & Riggio, 2006) to coach–athlete relationship theories (Jowett & Poczwardowski, 2007) to motivation-oriented theories, such as achievement goal theory (Ames, 1992a, 1992b; Nicholls, 1989) and self-determination theory (SDT; Deci & Ryan, 1985, 2000). The present thesis is guided by SDT, which is a metatheory of human motivation and personality.

Organized leisure activities have been suggested as an effective vehicle to promote positive development (Larson, 2000), and the most popular organized leisure activity among young people in Sweden is sports (Statistics Sweden, 2009). Not all young people, however, have positive experiences from sports participation, and sports involvement has been associated with both positive (e.g., increased self-esteem and well-being) and negative (e.g., burnout and stress) experiences and outcomes (Côté, Bruner, Erickson, Strachan, & Fraser-Thomas, 2010). Researchers in sport (e.g., Côté et al., 2010) and developmental psychology (e.g., Eccles, Barber, Stone, & Hunt, 2003) have emphasized the importance of supportive relationships, relationships with adults, and appropriate role models as facilitating factors of young athletes’ healthy development. There is also some evidence suggesting that the influence of these various sources on young athletes’ healthy development changes across adolescence. Specifically, the importance of parents’ feedback seems to decline, whereas the importance of coaches appears to increase during adolescence (Horn & Butt, 2014).

Coaches are considered to be one of the most influential motivational factors for young athletes and play a central role in shaping their sporting environment (Côté et al., 2010; Mageau & Vallerand, 2003; Ntoumanis, 2012; Reimer, 2007). The central role that sports coaches are assumed to play in shaping young athletes’ experiences has stimulated several lines of research on the coach–athlete relationship, and athlete outcomes have received much attention in sport psychology research. One of the key
outcomes is athlete well-being, which is a central component for positive experiences through sports participation (Gagné & Blanchard, 2007; Smoll & Smith, 2002). The present thesis is focused on the leadership process in sports and specifically how coaches’ autonomy-supportive and controlling interpersonal styles longitudinally are related to young athletes’ motivation and ill- and well-being. Of particular interest are the dynamic and potentially reciprocal or reversed associations over time (see Study 1 and Study 2), which generally have received little attention in leadership research (Avolio, 2007) as well as in SDT-based research on sports coaches (Ntoumanis, 2012). My aim is also to go beyond the unidimensional conceptualization of coaches’ autonomy-supportive and controlling interpersonal styles and examine multidimensionality in measures of coaches’ controlling and need-supportive interpersonal styles (see Study 3).

The present thesis is organized into five parts. First, I will explicate my epistemological and ontological positions. Second, I will provide a brief overview of some of the most common leadership frameworks in the sport psychology literature and contrast them with SDT. Third, I will provide an overview of SDT-based research on leadership in sports. Fourth, I will provide a summary of the empirical studies. And fifth, I will synthesize the findings in the discussion.

Epistemological and Ontological Positions

Sport and exercise psychology have gone through a paradigmatic evolution (see Kuhn, 2012, for a discussion about paradigms) during the 20th century, an evolution nicely summarized by Vealy (2006):

The “box” evolved from the “subjectivity” of philosophy, to the “hardscience” of experimental psychology, to motor behavior, and finally to social psychology so that more contextually relevant knowledge about sport and exercise could be pursued. Theoretically, the “box” moved from perception and sensation, to traits, to dispositions, to cognitions, to socially constructed cognitions within unique social contexts. And finally, the “box” moved from positivism to what seems to now be a post-positivistic, modernist era with some movement toward constructivism. (p. 148)

The box Vealy referred to represents the dominant paradigm that serves as a model for research and application as it evolves through successive historical eras (Kuhn, 2012). Vealy (2006) also pointed out that the field is in an era of diversification in terms of theories, research, and methods and that a strong
knowledge base is being identified, established, used, and disseminated. Despite this, a recent review of qualitative research between 2000 and 2009 in three sport and exercise psychology journals revealed that positivist/post-positivist approaches maintain a predominant position in sport and exercise psychology research (Culver, Gilbert, & Sparkes, 2012). Of the 183 articles included in the review, only 13.7% of the authors took an epistemological stance, and this percentage is probably lower among articles presenting quantitative data. Culver et al. (2012) suggested that:

*positivists/postpositivists have a privileged stance in sport psychology, which may lead them to disregard the need to identify their epistemology, it being assumed. (p. 278)*

To highly generalize, within the positivist/post-positivist paradigm, an ontological assumption is that there exists one objective reality and an epistemological belief in science’s ability to capture something about this reality (Giacobbi, Poczwardowski, & Hager, 2005; Martela, 2015).

Another philosophy of science that recently has regained attention in the social sciences is pragmatism. A pragmatic philosophy of science is viewed as an alternative to both positivist/post-positivist and constructivist philosophies that potentially can mediate or overcome the conflict between positivism and constructivism (Giacobbi et al., 2005; Martela, 2015; Zyphur & Pierides, 2015). Originating from Dewey (1908, 1938), James (1907), and Peirce (1931), pragmatism relies ontologically on *ontological experientialism*, meaning that humans are embedded in a world of experiencing that they can never escape and that humans are living in a world in which they need to act. In line with this ontological position, the world is not something to be “objectively” observed but something in which humans already aim to live their lives as best they can (Martela, 2015). A pragmatist epistemology can be described as a *fallibilistic instrumentalist epistemology* relying on an assumption that all one’s beliefs are future-oriented rules for action (James, 1907). Embracing the notion of fallibilism is to say that one cannot be absolutely sure of anything, that is, one cannot reach perfect certitude. Instead, one’s knowledge always consists of uncertainty and indeterminacy and can always be subject to change in the future (Martela, 2015; Peirce, 1931). Instead of trying to find an objective reality and seeking correspondence, pragmatists have an ends-in-view approach (Dewey, 1938) and are trying to find practical solutions to worldly problems that matter (Zyphur & Pierides, 2015).

Dewey (1938) described inquiry as a process of active engagement through the construction of various forms of knowledge and experience resulting from collective activities. Dewey proposed that ways of investigating phenomena give shape to a set of strategies to solve problems,
whether they be practical (i.e., situations that arise in daily life), theoretical (i.e., scientific problems), factual (e.g., describing an entity or process), or of value (i.e., what to do in a particular situation). Recently, Zyphur and Pierides (2015) proposed a pragmatist theory of quantitative research grounded in the work by early pragmatists such as Dewey (1938), James (1907), and Mead (1929) as well as more recent work by Martela (2015) and Rorty (1982). It starts with a simple assertion that research is a kind of work done by people and that adhering to this pragmatic approach means valuing the practical effects of doing quantitative research. To briefly describe Zyphur and Pierides’s (2015) pragmatic theory of quantitative research, they present five “themes” for their theory—tools, socialization, habits, experience, and truth and knowledge—as a way to grapple with quantitative research as a kind of work. The basic notion is that humans did not evolve to be abstract thinkers and observers of a singular external reality, but instead, humans survive by organizing activities that put thinking, language, and objects to work as tools in specific environments (Wittgenstein, 1973). Furthermore, people do not exist in a vacuum but seem to be inclined to act with and in relation to other people (Baumeister & Leary, 1995). Socialization processes make it possible to create and to enter into a community, which requires learning specific ways of thinking and using language to coordinate action. Hence, researchers socialize into specific communities of practice, and within these, they create ideas about what the world is like and how to go about conducting research to gain knowledge about the world. Following this socialization into communities, some of the activities become habits, that is, “a way of being that is fluently undertaken, going unquestioned unless problems arise” (Zyphur & Pierides, 2015, p. 13). Many work practices become habitual, such as thinking, use of language, or working with material objects such as surveys or statistical software. These habits are consequences of one’s collective experiences and are more or less implicit agreements and in many ways guide one’s thoughts, language, and actions. Furthermore, an external reality is not viewed as a cause of experience, which those adhering to the idea of a singular external reality would argue, but rather, objects or notions of foundations exist as experiences during activities. An external stimulus is the occasion for experience, not its cause (Mead, 1903). “The point is that to organize work by socializing or training researchers in habits of thought, language, and action is to collectively organize the experiences that are associated with the activity that defines a research community” (Zyphur & Pierides, 2015, p. 18). The final theme relates to questions about truth and knowledge, on which pragmatists note that after 2,500 years of debate, there is no agreement on what truth and knowledge is, and the attempts so far, such as theories of representation and correspondence, create various seemingly unsolvable problems. Pragmatists are trying to move beyond unrealistic ideals about
truth and knowledge and instead focus on whatever works in the situation, guiding action to reach practical ends (James, 1907). As Kuhn (2012) pointed out, the standards for what is known as right or real vary in different communities, and disagreements are resolved in relation to what is known and how to know about it. The criteria for what is right or real are institutionalized to standardize the thoughts, practices, and discourses that are considered reasonable (Slager, Gond, & Moon, 2012). To put it simply, instead of simplified ideas about correspondence and representation with an external reality, “a pragmatist approach to research can focus on finding whatever will work for specific people, at a specific time, doing specific things, with problems and interests that are local and more or less practical” (Zyphur & Pierides, 2015, pp. 22–23). I position myself as a pragmatist, as this approach to research with an ends-in-view focus (i.e., finding practical solutions to practical problems) corresponds well to my ideas about what research is about. The present thesis is mostly concerned with what Dewey (1938) referred to as theoretical (i.e., scientific) problems, and of particular interest are the notions of reciprocal or reversed associations and multidimensionality.

**Leadership Research in Sport Psychology**

Leadership is one of the major research areas in sport psychology (Lindahl, Stenling, Lindwall, & Colliander, 2015) and is referred to as a reemerging theme in the sport psychology literature (Weiss & Gill, 2005). Leadership research in psychology has a long history, going back to the early studies by Lewin, Lippet, and White (1939), who examined the role of leadership styles on children’s aggressive behaviors. The specific interest in leadership in sports, however, really took off during the 1970s. Besides autonomy support and controlling behaviors, as outlined in SDT (Deci & Ryan, 1985, 1987, 2000), two of the most influential approaches to leadership in sports since the 1970s have been the mediational model of leadership (Smoll & Smith, 1989; Smoll, Smith, Curtis, & Hunt, 1978) and the multidimensional model of leadership (Chelladurai, 1978, 1990, 2007). There has also been a widespread interest in the coach-created motivational climate, following the initial work by Nicholls (1984, 1989) and Ames (1992a, 1992b), as well as an increased interest in transformational leadership in sports (Arthur & Tomsett, 2015). I will provide a brief overview of each of these frameworks, after which they will be contrasted with SDT.

**Mediational Model of Leadership**

With the mediational model of leadership, Smoll, Smith, and colleagues (e.g., Smoll & Smith, 1989; Smoll et al., 1978) suggested that athletes’ evaluative
reactions toward coaches’ actual behaviors (observed behaviors) are mediated by athletes’ perceptions and recall of coaches’ behaviors. Within the mediational model of leadership, a number of individual difference variables and situational factors are suggested to have a strong influence on the effect of coaches’ behaviors on athletes’ sports experiences. The primary tool for assessing coaches’ behaviors has been the Coaching Behavior Assessment System (CBAS; Smith & Smoll, 2007), which comprises coaches’ responses to desirable performances (e.g., reinforcement), responses to mistakes (e.g., mistake-contingent encouragement/instruction and punishment), responses to misbehaviors (e.g., keeping control), game-related behaviors (e.g., general technical instructions), and game-irrelevant behaviors (e.g., general communication). Coaches’ behaviors are influenced by personal characteristics, such as motives, goals, behavioral intentions, and sex, and situational factors, such as the nature of the sport, situation, and level of play. Athletes are affected by coaches’ behaviors based on how they interpret and evaluate coaches’ behaviors and personal characteristics, such as age, sex, competitive anxiety, and achievement motives, as well as situational factors (e.g., Smith & Smoll, 2007; Smith, Smoll, & Christensen, 1996).

Early research guided by the mediational model often combined observations of coaches’ behaviors with coaches’ perceptions of their own behaviors and youth athletes’ perceptions, recall, and evaluative reactions of coaches’ behaviors. From this research, a cognitive-behavioral training program for youth sports coaches was created, Coach Effectiveness Training (CETr), consisting of behavioral guidelines with the intention to increase reinforcing, encouraging, and supportive behaviors and decrease punitive behaviors (Smith, Smoll, & Curtis, 1979). Evaluations of the CETr using the CBAS (Smith, Smoll, & Hunt, 1977) have shown that CETr-trained coaches engage in more reinforcing, encouraging, and supportive behaviors than nontrained coaches (e.g., Smith et al., 1979). As a consequence of this behavior change, young athletes coached by CETr-trained coaches have reported reduced sports performance anxiety (Smith, Smoll, & Barnett, 1995); increased self-esteem, particularly among those with low self-esteem (Smith & Smoll, 1990; Smoll, Smith, Barnett, & Everett, 1993); a more positive evaluation of the coach; a better team atmosphere; and having more fun, and teams have reported lower levels of attrition (Smoll & Smith, 2002). Additionally, an important finding from Smith, Smoll, and colleagues is the low correlation shown between coaches’ perceptions of their own behavior and their actual (observed) behavior (e.g., Curtis, Smith, & Smoll, 1979). The CETr laid the groundwork for the current Mastery Approach to Coaching (MAC; Smith, Smoll, & Cumming, 2007; Smoll, Smith, & Cumming, 2007), which has integrated the CETr principles with achievement goal theory (Ames, 1992a, 1992b; Roberts, 2012). The research program focuses on how
coaches can create an athletic environment that promotes fun, effort, and commitment to get better, where skill development is defined as success and pressure to win is minimized (Smoll & Smith, 2002).

**Multidimensional Model of Leadership**
The multidimensional model of leadership (Chelladurai, 1978, 1990, 1993, 2007) provides a framework for effective coaching behaviors in sports and proposes that member satisfaction and performance outcomes can be used as measures of coaching effectiveness. Coach behaviors that produce the desired outcome in terms of group performance and satisfaction are seen as an interaction between three aspects of leader behavior, namely the leader’s actual behavior, athletes’ preferred leader behavior, and leader behaviors required in the specific situation. Specific antecedents or circumstances in turn affect each of these aspects of leader behavior. Required leader behavior is influenced by situational characteristics (e.g., goals of the group, type of task, competitive level) and athletes’ characteristics (e.g., age, gender, skill level, psychological characteristics). Preferred leader behavior is determined by athletes’ characteristics and characteristics that are specific to the sport situation (e.g., type of, sport social norms, organizational expectations). Actual leader behavior is influenced by the leader’s personal characteristics (e.g., age, gender, expertise, psychological characteristics) and also by required and preferred leader behaviors. Consequently, actual leader behavior is also influenced by situational characteristics through the influence of required and preferred leader behaviors as well as the athletes’ level of satisfaction and performance. A fundamental hypothesis of the model is that the degree of congruence between the three aspects of leader behaviors will influence the outcome variables of performance and athlete satisfaction. If the coach engages in behaviors that meet the situational demands and are in line with the athletes’ preferences, then optimal performance and member satisfaction will be achieved.

The majority of research with the multidimensional model of leadership has operationalized leadership preferences with the Leadership Scale for Sports (LSS; Chelladurai & Saleh, 1980). This instrument comprises five dimensions of leadership behaviors: training and instruction, democratic behavior, autocratic behavior, social support, and positive feedback. In an extensive summary of research on the multidimensional model of leadership, Reimer (2007) concluded that positive athlete outcomes (e.g., athlete satisfaction) seem to be related to training and instruction and positive feedback behaviors, which also are the most preferred leadership behaviors, whereas autocratic behaviors are the least preferred (cf. Chelladurai, 1993). There are inconclusive results regarding the congruence hypothesis, with a few studies examining congruence between preferred and actual leadership behaviors and almost no studies on the congruence between required, actual,
and preferred leadership (Reimer, 2007). The multidimensional model provides a comprehensive framework, but research with the model has so far been simplistic, correlational, and has not examined the proposed causal links in the model. Segments of the model have been tested, including only a limited number of situational, leader, and athlete characteristics (Reimer, 2007).

Motivational Climate
Within achievement goal theory, the social environment is emphasized as having motivational significance (Ames, 1992a, 1992b; Ames & Ames, 1984; Elliot, 2005; Nicholls, 1989). Ames (1992b) accentuated how structures established by the coach can facilitate athletes’ adoption of a task or ego orientation. Several structures influencing the motivational climate have been identified in achievement settings. Epstein (1988, 1989) originally proposed a multidimensional model of the motivational climate in educational settings under the acronym TARGET, representing task, authority, recognition, grouping, evaluation, and time structures of achievement situations. Later adopted by Ames (1992a, 1992b), TARGET was identified as six important structures possible to manipulate by coaches in order to create a mastery motivational climate in sports settings. When referring to the motivational climate according to Ames’s (1992b) definition, focus is often on the learning environment that is affecting athletes’ thoughts, feelings, and behaviors in achievement situations. A climate that is coach created reflects what coaches recognize, value, and evaluate regarding their athletes’ performance and learning, and this has consequences for the athletes’ psychosocial and behavioral responses (Newton, Duda, & Yin, 2000; Roberts, 2012). These achievement cues in the motivational climate have broadly been defined as consisting of mastery criteria (i.e., task-involving aspects) and performance criteria (i.e., ego-involving aspects; Ames, 1992a). In a mastery-oriented climate, athletes are given tasks that involve variety and diversity and are involved in the decision-making process. Coaches encourage effort, improvement, learning, and skill development, and success and competence is based on self-referenced criteria. From a learning perspective, mistakes are seen as part of the developmental process, and coaches give feedback to athletes with the aim of helping them in subsequent attempts toward task mastery. Athletes’ practice in heterogeneous and cooperative groups and time are flexible and maximized for improvement. In contrast, performance-climate tasks have a unidimensional design, and the coach is the sole decision maker. Normative standards regarding success and competence are promoted, outperforming others is praised, and social comparisons are frequently used. Grouping is made homogenously, and mistakes are followed by punitive feedback due to task failure and lack of ability. How athletes experience and interpret these
situational achievement cues influences the degree to which a mastery or performance climate is perceived as salient (Roberts, 2012).

Meta-analytic evidence supports the notion that a mastery climate is associated with adaptive motivational outcomes, such as perceived competence, self-esteem, objective performance, intrinsic forms of motivational regulation, affective states, practice and competitive strategies, moral attitudes, and the experience of flow. Perceiving a performance climate, on the other hand, was associated with maladaptive motivational outcomes, such as extrinsic regulation and amotivation, negative affect, maladaptive strategy use, antisocial moral attitudes, and perfectionism and was negatively associated with positive affect and feelings of autonomy and relatedness (Harwood, Keegan, Smith, & Raine, 2015; Ntoumanis & Biddle, 1999). Harwood et al. (2015) noted that the vast majority of research in sports has focused on the coach-created motivational climate. The importance of coaches as creators of the motivational climate has also been found in in-depth interviews with elite athletes. A coach-created mastery climate was strongly preferred and perceived as conducive in regard to both performance and well-being. Coaches’ feedback, what they said and when they said it, and how they behaved toward the athletes emerged as important aspects related to the perceived motivational climate (Pensgaard & Roberts, 2002). Similar results were found among adolescent athletes. Through semistructured interviews in focus groups, a strong motivational antecedent emerged in coaches’ feedback behavior, particularly through their verbal feedback and behavioral reinforcement. When coaches engaged in positive feedback, it was generally seen as a positive influence on motivation, whereas negative feedback was seen as a negative influence. Rewards for desirable behaviors (e.g., effort) were generally seen as positive for the athletes’ experience, and oppositely, punitive behaviors were related to negative affect and avoidance behaviors (Keegan, Spray, Harwood, & Lavallee, 2010).

**Transformational Leadership**

Despite being the dominant leadership theory in the organizational domain during the last decades (Gardner, Lowe, Moss, Mahoney, & Cogliser, 2010; Lowe & Gardner, 2000), transformational leadership has gained surprisingly little attention in the sport psychology literature. In a recent review, only 14 empirical research papers were identified that examined transformational leadership in a sports setting (Arthur & Tomsett, 2015). Given the recent gain in interest for transformational leadership, I find it appropriate to include it in this brief review of leadership theories in sport psychology research.

Transformational leadership is based on a strong identification with the leader and the social unit where the leadership takes place. In this process,
the leader raises follower awareness, understanding of moral values and inspiring visions, and encourages followers to transcend their own personal goals and interests for the collective good (Bass, 1999; Bass & Riggio, 2006). Transformational leadership comprises four dimensions (Bass, 1985): idealized influence (the leader acts as a role model who earns the admiration of followers and articulates high expectations about the group’s goals and mission), inspirational motivation (the leader provides meaning and a clear and attractive vision while demonstrating confidence that goals can be achieved), intellectual stimulation (the leader encourages followers to make their own decisions, both creative and innovative), and individualized consideration (the leader acts as a coach and mentor, considering followers’ individual needs, strengths, and aspirations). Transformational leadership is part of the full-range model of leadership, which also encompasses several components of transactional leadership behavior and laissez-faire leadership behavior (Bass & Riggio, 2006). Transactional leadership can be exerted by rewarding or disciplining the follower based on the follower’s performance. When leaders are transactional, they use contingent reinforcement that is either positive (contingent reward) or negative (active or passive management by exception). Contingent rewards are viewed as a constructive transaction that is effective for motivating others and are considered transactional when the reward is a material one (e.g., bonus) and transformational when the reward is psychological (e.g., praise; Antonakis, Avolio, & Sivasubramaniam, 2003). Management-by-exception leaders either actively monitor followers’ deviations from standards, mistakes, and errors and take corrective action as necessary or passively wait for deviances from standards, mistakes, and errors and take corrective action after the fact (Bass & Riggio, 2006). Laissez-faire leadership is an avoidance or absence of leadership and is by definition inactive. Laissez-faire leaders ignore their responsibilities and avoid getting involved when important issues arise. Research in the organizational domain largely supports the effectiveness of transformational leadership and has shown positive associations with outcomes such as subordinates’ satisfaction, commitment, performance, and well-being (e.g., Gilbert & Kelloway, 2014). There is also meta-analytic evidence suggesting that transactional leadership predicts positive follower outcomes and that laissez-faire leadership is a negative predictor of various follower outcomes (e.g., Judge & Piccolo, 2004).

Although the positive effects of transformational leadership have been established in other contexts, studies in sports settings are scarce (Arthur & Tomsett, 2015). The few studies conducted nevertheless reveal that coaches’ transformational leadership is related to athlete motivation and performance (Arthur, Woodman, Ong, Hardy, & Ntoumanis, 2011; Bormann & Rowold, 2016; Charbonneau, Barling, & Kelloway, 2001), player aggression (Tucker, Turner, Barling, & McEvoy, 2010), team/task cohesion (Callow, Smith,
Hardy, Arthur, & Hardy, 2009; Smith, Arthur, Hardy, Callow, & Williams, 2013), and athletes’ basic psychological need satisfaction and well-being (Stenling & Tafvelin, 2014).

**Self-Determination Theory**
The theoretical framework guiding the present thesis is SDT (Deci & Ryan, 1985, 2000). SDT can broadly be described as a macrotheory developed to explain human motivation and personality. SDT is guided by the assumption that people are active organisms, with evolved tendencies toward growth, mastery, and integrating new experiences into a coherent sense of self. These evolved tendencies toward development require ongoing social support and nutriments; they do not operate automatically, and the social context can either support or thwart these natural tendencies toward growth, active engagement, and coherence (Vansteenkiste & Ryan, 2013). Deci and Ryan (2000) described SDT as an organismic dialectical approach, where the dialectic between the active organism and the social context is the basis for predictions about behavior, experience, and development. The primary nutriments for healthy development and effective functioning are specified within SDT using the concept of basic psychological needs. The needs are viewed as innate, rather than acquired, and they are defined at the psychological level, rather than the physiological level (Deci & Ryan, 2000). In SDT, needs specify “innate psychological nutriments that are essential for ongoing psychological growth, integrity, and well-being” (Deci & Ryan, 2000, p. 229). Three specific needs have been identified within SDT, namely the needs for autonomy, competence, and relatedness (Ryan & Deci, 2000a). The need for autonomy is defined as an endorsement of one’s actions, flexibility, an absence of pressure, and a sense that one is engaging in the action voluntarily (de Charms, 1968; Deci & Ryan, 1985). The need for competence implies that a person wants to interact effectively with the environment and experience a sense of adequate ability (Harter, 1978; White, 1959). The need for relatedness represents a desire to feel connected to significant others, to be cared for, and to care for others in a safe environment (Baumeister & Leary, 1995). From a functional perspective, optimal functioning and well-being are expected to occur under circumstances that continuously support need satisfaction, whereas under conditions where the needs are thwarted, nonoptimal functioning and ill-being are expected (Deci & Ryan, 2000). The assumption that ongoing support for need satisfaction facilitates optimal functioning, performance, and well-being has been supported by meta-analytic evidence in various domains, ranging from exercise (Teixeira, Carraca, Markland, Silva, & Ryan, 2012) to sports (Li, Wang, Pyun, & Kee, 2013) to health contexts (Ng et al., 2012) to performance settings (Cerasoli, Nicklin, & Ford, 2014; Deci,
Koestner, & Ryan, 1999) to work contexts (Van den Broeck, Ferris, Chang, & Rosen, 2016).

SDT is a macrotheory that formally consists of six subtheories each developed to address various facets of motivation, personality, and processes related to motivationally based phenomena (see Ryan & Deci, 2002; Taylor, 2015; Vansteenkiste, Niemiec, & Soenens, 2010; Weinstein, 2014, for reviews of SDT and its subtheories). A comprehensive review of all six subtheories is beyond the scope of this thesis, but I will, in the following section, briefly describe the subtheories in SDT relevant to what is presented herein.

Cognitive evaluation theory (CET) was the first subtheory developed within SDT (Deci, 1975; Deci & Ryan, 1980). It was specifically developed to identify and understand various external events (and later, internal events; Ryan, 1982) that influence people’s intrinsic motivation. Intrinsic motivation is displayed when people are fully engaged in an activity out of interest, curiosity, or a sense of volition and functions without external rewards or constraints (Deci & Ryan, 2000). In other words, when people engage in activities for their own sake because such behaviors are rewarding in and of themselves, they are intrinsically motivated. With the development of CET, the goal was to examine how factors such as rewards, feedback, surveillance, evaluations, and ways of communication enhance or diminish people’s intrinsic motivation, as displayed by interest, enjoyment, and persistence in activities (Ryan & Deci, 2002).

The early work on CET focused on intrinsic motivation and was based on a dualistic distinction between intrinsic and extrinsic motivation. This distinction, however, did not provide a nuanced picture of human motivation that could explain the variety of activities that people engage in. With the second subtheory, organismic integration theory (OIT), Deci and Ryan (1985) provided a broader picture of various types of extrinsic motivation able to explain behavior that is characterized by the goal of obtaining outcomes separable from the behavior. Instead of viewing intrinsic and extrinsic motivation as antithetical, four different types of extrinsic regulations were identified as being more or less internalized and integrated into one’s self. Intentional behavior can be classified according to the extent it is self-regulated versus regulated by forces outside the self, which indexes the relative integration of action. Increased internalization and integration of behavioral regulation represents a transition from an external perceived locus of causality to an internal (Ryan, 1995). Hence, within OIT, extrinsic motivation is assumed to vary in the degree to which it has been internalized and integrated into the person (Deci & Ryan, 2000). Within SDT, there is a broad distinction between autonomous and controlled types of motivation (Deci & Ryan, 2000, 2008). Besides intrinsic motivation, autonomous motivation includes extrinsic types of motivation (integrated and identified) toward activities that the person has integrated and identified as important
and in line with his or her values. Autonomous motivation has been integrated into the person’s sense of self, and autonomously motivated people experience volition and self-endorsement. Controlled motivation, on the other hand, consists of external regulation, when one’s behavior is driven by external rewards or punishments, or introjected regulation, when the behavior is a function of avoidance behaviors, contingent self-esteem, or ego involvements. Controlled motivation leads people to experience pressure to think, feel, and behave in certain ways. In contrast to autonomous and controlled motivation, which energize and direct behavior, stands amotivation, which refers to a lack of motivation and intention. Within the appropriate social conditions, people take in and accept values and norms that regulate and guide behavior, by the process of internalization. Behaviors that previously were considered as external prompts can over time become increasingly integrated into the person and self-regulated (i.e., motives for tasks become more autonomous; Ryan, 1995).

The organismic dialectical component embraced within SDT suggests that people interact with various internal and external forces in the social context that support or hinder individuals’ active engagement, growth, and development (Ryan & Deci, 2000a). It is proposed that growth, development, and well-being are most likely to occur in social contexts that provide support for the basic psychological needs of autonomy, competence, and relatedness (Deci & Ryan, 2000; Vansteenkiste & Ryan, 2013). In a third subtheory, basic psychological needs theory (BPNT), the basic psychological needs are, as previously described, argued to be the essential nutriments for growth, development, and well-being. The BPNT is integrated with the CET and OIT, as it provides a framework that specifies the explanatory mechanisms through which the social context influences people’s intrinsic motivation, as proposed within CET, and the internalization process proposed within OIT.

**Why SDT as the Theoretical Framework?**
Given the availability of different frameworks that could be applied to understand the leadership process in sports, one might wonder how the guiding framework of the present thesis—SDT—differs from these other frameworks. In an attempt to identify how SDT differs from the four abovementioned frameworks, I highlight three main aspects: (1) process clarity, (2) empirical support, and (3) origin and school of thought. SDT has a clearly defined and empirically supported process model that proposes the basic psychological needs of autonomy, competence, and relatedness as explanatory mechanisms in the process through which social-contextual factors, such as coaches’ autonomy support and control, influence people’s motivation, well-being, and subsequent behaviors (Deci & Ryan, 2000, 2014; Ng et al., 2012). In the mediational model of leadership, athletes’ evaluative
reactions are hypothesized to mediate the relationship between coaches’ actual behavior and athlete outcomes (Smoll et al., 1978), a mediating effect that has been found for punitive behaviors, but the results were more ambiguous for supportive behaviors (Smoll & Smith, 2007). Moderators, such as athlete or coach individual difference variables (e.g., sex, achievement motives, anxiety, self-esteem) or situational factors (practices versus games), have received far more attention than mediators in research with the mediational model of leadership (cf. Smoll & Smith, 2007). In the multidimensional model of leadership, several mediational paths are specified, for example, from leader characteristics to athlete and team performance through leaders’ actual behaviors (Chelladurai, 2007). This process, however, has not been empirically examined. Although several mediators have been examined in the transformational leadership literature (cf. Tafvelin, 2013; Turnnidge & Côté, 2016), a major critique of transformational leadership theory is that the mechanisms through which transformational leaders influence followers are still poorly understood and not explicitly identified (e.g., van Knippenberg & Sitkon, 2013; Yukl, 1999). Within achievement goal theory (e.g., Ames, 1992a, 1992b; Nicholls, 1989), which motivational climate research rests upon, various process models have been specified (e.g., Dweck, 1986; Dweck & Legget, 1988; Elliot, 1999). One key variable in these process models is athletes’ perceptions of competence, which has been specified as a mediator or moderator of the relationship between the coach-created motivational climate and athlete outcomes (e.g., Elliot, 1999; Nicholls, 1989; Roberts & Kristiansen, 2012). Others have suggested that there are interactive effects between athletes’ goal orientations and the motivational climate that affect subsequent behavior. There is, however, limited research on this interaction and its influence on outcomes (Roberts, 2012). Furthermore, although most motivational climate research in sports has focused on the coach-created climate, it is debated whether the items in measurements used (e.g., the Perceived Motivational Climate in Sport Questionnaire-2 [PMCSQ-2]; Newton et al., 2000) truly refer to the coach or the more general climate of the team (Harwood et al., 2015).

While reviewing the empirical support for these frameworks, I have noticed that the multidimensional model of leadership and transformational leadership theory have received far less attention in the sport psychology literature compared to SDT and research on the motivational climate. As Reimer (2007) pointed out, only fractions of the propositions within the multidimensional model of leadership have been investigated, and Arthur and Tomsett (2015) noted that only 14 studies were published on transformational leadership in sports settings. SDT and motivational climate research has received considerable attention in the sport psychology literature, illustrated by, for example, an entire volume dedicated to SDT.
research in sport and exercise psychology (Hagger & Chatsizarantis, 2007) and a meta-analysis including 104 published studies on intrapersonal correlates of the motivational climate in sports and physical activity (Harwood et al., 2015). The mediational model of leadership received quite a lot of attention during the late 1970s to mid-1990s (see Smoll & Smith, 2002, for an overview) but has more recently been integrated into research on the motivational climate (e.g., Smith et al., 2007; Smoll et al., 2007). The integration of the mediational model with motivational climate research is logical, given that both are social-cognitive approaches to leadership (Smoll & Smith, 2007).

Finally, these theoretical frameworks originate from and reside within different schools of thought. Transformational leadership theory synthesizes work by several scholars (e.g., Berlew, 1974; Burns, 1978; Downtown, 1973; House, 1977; Weber, 1924/1971, 1947) sharing the common notion that leadership involves inspiring followers via charismatic or emotional appeals, which often includes some sort of vision component (Arthur & Tomsett, 2015). Similarly, Chelladurai (1978, 1990) tried to synthesize the major ideas and findings from leadership research in organizational psychology (e.g., Bass, 1985; House, 1971; Osborne & Hunt, 1975; Yukl, 1971) into the multidimensional model of leadership. The mediational model of leadership (Smith & Smoll, 2007) and motivational climate research (Ames, 1992b; Roberts, Treasure, & Conroy, 2007) are both described as social-cognitive approaches (e.g., Bandura, 1986), in which beliefs, thoughts, and perceptions are viewed as the basis of understanding motivation and behavior (Roberts, 2012). SDT is an organismic theory, acknowledging that people have innate psychological needs that are the energizing forces underlying motivation and also recognizing the dialectic occurring between the organism and the social context (Deci & Ryan, 1985, 2000). SDT is built upon the early work by humanistic psychologists (e.g., Angyal, 1941; Maslow, 1968; Rogers, 1961) and the notion that “fully functioning humans are those who are acting in accordance with an ‘organismic valuing process’ occurring within themselves” (Sheldon & Kasser, 2001, p. 34). Such innate tendencies toward authenticity, growth, and meaning are not acknowledged in social-cognitive models, which view behavior as largely determined by roles and situations (Deci & Ryan, 1985; Sheldon & Kasser, 2001). Criticism toward SDT is, nevertheless, evident in the literature, and much of this critique relates to the notion of basic psychological needs. In commentaries on the seminal paper by Deci and Ryan (2000), several scholars questioned the notion of basic psychological needs, asking questions about what constitutes a basic human need; questioned the evidence to support the three specific needs proposed within SDT; argued that the three needs are not structurally equivalent; and also questioned the assumption that humans have a natural tendency toward growth (e.g., Buunk & Nauta, 2000; Carver & Scheier, 2000; Pyszczynski,
Greenberg, & Solomon, 2000; see also Hardy, 2015). Regarding SDT-based research in sports, Hardy (2015) argued that there is a need to challenge some of the basic tenets of SDT and explore how robust the subtheories really are and what the boundary conditions of the subtheories are, instead of merely accepting the basic tenets of SDT, and to find ways to apply them to sports. Researchers could, for example, specify two or more competing hypotheses based on different theories to explain a certain phenomenon (e.g., well-being or sports performance) and design studies to tease out the explanatory value of each theory. Much of the criticism highlights important questions in need of further investigation. Despite this criticism, from a functional perspective, the explanatory mechanisms (i.e., the innate psychological needs) through which the social context influences people's motivation, well-being, and subsequent behavior make SDT particularly useful for explaining the leadership process in sports.

A Self-Determination Theory-Based Model of the Coach–Athlete Relationship

Guided by the assumption that ongoing support for need satisfaction is essential for optimal functioning, integration, and well-being, this thesis focuses on one central aspect shaping the sport environment and thus influencing athletes’ need satisfaction, namely coaches’ interpersonal styles (interpersonal styles and behaviors will be used interchangeably). Although many factors can influence young athletes’ ongoing development, motivation, performance, and well-being, coaches are considered to be one of the most influential motivational factors in sports settings (e.g., Gaudreau et al., 2016; Mageau & Vallerand, 2003; Reimer, 2007; Smith & Smoll, 2007). There are, as previously described, several theories and models explaining coaches’ interpersonal styles and how these various interpersonal styles influence athletes’ motivation, performance, and well-being. The work in the present thesis has been guided by an overarching motivational model of the coach–athlete relationship developed by Mageau and Vallerand (2003). The motivational model (see Figure 1) is, according to Mageau and Vallerand, grounded in CET (Deci & Ryan, 1985), which is one of the subtheories within SDT, and the hierarchical model of intrinsic and extrinsic motivation (HMIEM; Vallerand, 1997; Vallerand & Losier, 1999). The motivational model, however, also includes the OIT and BPNT (Deci & Ryan, 1985, 2000). With the HMIEM, Vallerand (1997, 2007) proposed a four-stage motivational sequence (social factors → psychological mediators → types of motivation → consequences) building on the elements of SDT. The motivational sequence is specified on three distinct but interrelated levels (i.e., global, contextual, and situational; see also Ryan, 1995).
Figure 1. A modified version of Mageau and Vallerand’s (2003) motivational model of the coach–athlete relationship.
The global level represents personality traits that predispose individuals to be more or less autonomously motivated in their interactions with the environment. The contextual level represents a person’s general motivational orientation toward a specific context (e.g., leisure, sport, or work). The situational level represents a motivational state in a given situation. The work presented in the present thesis focuses solely on the contextual level. Furthermore, given that I have not examined the specific corollaries specified within the HMIEM, such as the interrelations between the hierarchical levels or intrinsic motivation as a multidimensional construct, a complete description of the model will not be provided. Interested readers are referred to Vallerand (1997, 2007) for an overview of the HMIEM.

Briefly summarized, in the motivational model, Mageau and Vallerand (2003) proposed that coaches’ interpersonal motivating styles are influenced by their personal orientation toward coaching, the coaching context, and the athletes’ behavior and motivation. In turn, coaches’ interpersonal styles influence athletes’ satisfaction of the needs for autonomy, competence, and relatedness, which have beneficial impact on athletes’ autonomous motivation. Finally, autonomous motivation is related to adaptive outcomes, such as improved performance and well-being, and controlled motivation is related to maladaptive outcomes, such as ill-health (e.g., Cerasoli et al., 2014; Gagné, Ryan, & Bargmann, 2003; Ng et al., 2012).

**Autonomy-Supportive and Controlling Interpersonal Styles**

Deci and Ryan (1987) argued that contextual factors play a crucial role when people initiate and regulate behavior, but they also argued that these contextual factors do not determine behavior in a direct sense (Deci & Ryan, 1985). People ascribe psychological meaning—referred to as functional significance—to the contextual factors, and the meaning is the crucial element in determining behavior. When considering social-contextual factors, the primary interest lies in whether they have a functional significance of being either autonomy-supportive or controlling, and how each type of functional significance is related to peoples’ experience and behavior (Deci & Ryan, 1987). Research on coaches’ interpersonal styles indicates that autonomy-supportive and controlling interpersonal styles play a major role in shaping athletes’ performance and psychological experiences (Mageau & Vallerand, 2003; Ntoumanis, 2012). When coaches are autonomy-supportive, they take the athletes’ perspective, provide explanatory rationales for tasks, limits, and rules, acknowledge the athletes’ feelings, and provide relevant information and opportunities for choice within specific limits and rules, while at the same time minimizing pressure and demands (Mageau & Vallerand, 2003). Autonomy support also involves encouraging self-initiation, curiosity, allowing time for self-paced learning and development, and relying on a noncontrolling language (Grolnick &
Ryan, 1989; Reeve, 2009). In line with de Charms’s (1968) concept of personal causation, by providing autonomy support, coaches regard athletes as individuals deserving autonomous self-regulation and allow them to be the origin of their own behavior.

A controlling interpersonal style is characterized by pressuring athletes to think, feel, or behave in specific ways, which undermines psychological need satisfaction (Ntoumanis, 2012; Reeve, 2009). Coaches with a controlling interpersonal style place value on control and power-assertive techniques that pressure athletes to comply (Mageau & Vallerand, 2003). In contrast to autonomy support, controlling coaches’ prioritize their own perspective and let it overrun the athletes’ perspective via intrusion and pressure (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009, 2010; Reeve, 2009). Coaches with a controlling interpersonal style are likely to (implicitly or explicitly) view athletes as pawns to be controlled and governed to obtain a certain outcome (de Charms, 1968).

In hierarchical relationships, such as teacher–student, manager–employee, parent–child, and coach–athlete, but also in mutual relationships, such as peer relationships and partners, autonomy support has been linked to a range of positive outcomes, whereas controlling behaviors have been linked to negative outcomes (Deci & Ryan, 2014). Autonomy support has been related to enhanced depth of information processing, motor learning, test performance, and persistence in cognitive and motor tasks (Hooyman, Wulf, & Lewthwaite, 2014; Vansteenkiste, Simon, Lens, Sheldon, & Deci, 2004). Two recent longitudinal studies showed that receiving autonomy support from romantic partners was linked to lower blood pressure in general and during conflict (Weinstein, Legate, Kumashiro, & Ryan, 2016). Another study on the association between biological stress (i.e., salivary cortisol) and interpersonal styles during a learning activity showed that an autonomy-supportive teaching style lowered cortisol, whereas a controlled style increased cortisol level compared to a neutral style (Reeve & Tseng, 2011). Continuing the biological track, neuroscience studies suggest that when people engage in activities for autonomous reasons, there is an increased insular cortex activity, which is involved in emotional processing, whereas engaging in activities for controlled reasons increases posterior cingulate cortex activity, which is generally interpreted as weighing the learned value of external stimuli (Lee, Reeve, Xue, & Xiong, 2012). Autonomously engaging in behavior has also been related to increased anterior insular cortex activity, which is known to be active when people feel agentic, whereas engaging for controlled reasons increased angular gyrus activity, known to be active when people experience a loss of agency (e.g., experience pressure; Lee & Reeve, 2013). Finally, a recent meta-analysis included effect sizes from 184 independent data sets and examined the SDT-based four-stage motivational sequence by combining meta-analytic
techniques with path analysis (Ng et al., 2012). Autonomy support was directly and indirectly related to need satisfaction, autonomous motivation, and mental and physical health outcomes. Taken together, these findings across various domains display a quite consistent pattern with regard to the correlates of autonomy-supportive and controlling interpersonal styles.

**Sports Coaches’ Interpersonal Styles**

Coaches’ autonomy-supportive and controlling interpersonal styles have also received considerable attention in the sport psychology literature. It should be noted that autonomy support is, despite the label, theorized to (Mageau & Vallerand, 2003; Ryan & Deci, 2000b), and has often been empirically shown to, satisfy all three basic psychological needs, not just the need for autonomy (e.g., Adie, Duda, & Ntoumanis, 2008, 2012; Amorose & Anderson-Butcher, 2005; Ng et al., 2012; Quested & Duda, 2011). In the following section I will provide a brief overview of sport psychology research on the correlates of coaches’ autonomy-supportive and controlling interpersonal styles. This review will be divided into three parts according to three broadly defined study designs: cross-sectional, longitudinal, and intervention studies.

**Cross-sectional studies**

Cross-sectional studies have shown that perceived autonomy support from coaches is related to athletes’ basic psychological need satisfaction and self-determined motivation (Amorose & Anderson-Butcher, 2005), need satisfaction, vitality, negative affect, skill and performance self-concept (Adie et al., 2008; Felton & Jowett, 2013), autonomy need satisfaction, psychological and physical well-being (Reinboth, Duda, & Ntoumanis, 2004), and need satisfaction, enjoyment, and intentions to drop-out of sports (Quested et al., 2013). Perceived coach autonomy support has further been associated with autonomous motivation, prosocial behaviors (Hodge & Lonsdale, 2011; Hodge & Gucciardi, 2015; Ntoumanis & Standage, 2009), as well as sport-based (Fenton, Duda, & Barrett, 2016) and leisure-time physical activity assessed with ActiGraph accelerometers among young football players (Fenton, Duda, Quested, & Barrett, 2014). Conversely, in cross-sectional studies, perceptions of a controlling interpersonal style have been negatively related to athletes’ autonomy need satisfaction, self-determined motivation, and subjective well-being (Blanchard, Amiot, Perreauly, Vallerand, & Provencher, 2009). Coaches’ controlling behaviors have also been negatively associated with autonomy and competence need satisfaction and positively related to negative affect and skill and performance self-concept (Felton & Jowett, 2013), controlled motivation, antisocial behaviors, moral disengagement, attitudes toward doping, and doping susceptibility (Hodge & Gucciardi, 2015; Hodge, Hargreaves,
Gerrard, & Lonsdale, 2013; Hodge & Lonsdale, 2011; Ntoumanis & Standage, 2009). Interpersonal control from coaches has further been related to a variety of ill-being indicators, such as athlete need thwarting, depression, disordered eating, negative affect, and burnout (Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011). Taken together, these findings indicate a pattern of positive outcomes associated with perceived autonomy support and negative outcomes associated with perceiving coaches as controlling. Although cross-sectional studies provide us with estimates of how variables are related based on theory, it is well known that the direct associations are most often upwardly biased (Podsakoff, MacKenzie, & Podsakoff, 2012) and that the indirect associations, even under ideal conditions, are often highly misleading (Cole & Maxwell, 2003; Maxwell & Cole, 2007). In the following section, I review research on coaches’ autonomy-supportive and controlling interpersonal styles with stronger study designs—longitudinal and intervention studies—that allow us to examine temporal associations and approach causal inferences.

**Longitudinal studies**

In some longitudinal studies researchers have focused on prospective predictions, and these studies have often included both cross-sectional associations and prospective predictions. In a study of persistence in youth swimmers, perceived coach autonomy support was cross-sectionally associated with autonomous types of motivation that, in turn, were positively associated with long-term persistence (over two seasons). Coaches’ controlling behaviors were cross-sectionally associated with controlled types of motivation and amotivation that, in turn, were negatively associated with long-term persistence (Pelletier, Fortier, Vallerand, & Brière, 2001). Positive cross-sectional associations have also been found between perceived autonomy support from the coach and contextual and situational self-determined motivation, and situational motivation was in turn positively related to objectively measured tournament performance among judokas (Gillet, Vallerand, Amoura, & Baldes, 2010). Perceived autonomy support and controlling behaviors from the coach have cross-sectionally been related to cross-country runners’ need satisfaction and thwarting and mental toughness that, in turn, were related to positive and negative affect and end-season race time (Mahoney, Gucciardi, Ntoumanis, & Mallett, 2014). Positive associations have also been found between perceived autonomy support from the coach and autonomous goal motives at the start of the athletic season and relative psychological well-being at mid-season, whereas perceptions of coaches’ controlling behaviors were positively related to controlled goal motives at the start of the season that, in turn, were negatively related to relative psychological well-being at mid-season (Smith, Ntoumanis, & Duda, 2010). The four-stage motivational sequence, in line
with SDT, has also been examined in young athletes in elite training centers. Cross-sectional associations were found between perceptions of coaches’ autonomy-supportive and controlling behaviors and athletes’ need satisfaction, motivation, and longitudinal associations with burnout (Isoard-Gautheur, Guillet-Descas, & Lemyre, 2012). Some studies have also examined cross-sectional associations while controlling for levels at previous measurement points. Grounded in BPNT, perceived autonomy support has been directly related to all three basic psychological needs that, in turn, were related to burnout and subjective vitality (Balaguer et al., 2012; Quested & Duda, 2011). Perceptions of a controlling coach have also been linked to need thwarting and burnout (Balaguer et al., 2012). In a three-wave longitudinal study, perceived autonomy support and interpersonal control from the coach at the start of the season in opposite directions and indirectly predicted end-season engagement through mid-season need satisfaction (Curran, Hill, Ntoumanis, Hall, & Jowett, 2016). Autonomy support also negatively predicted mid-season disaffection, and interpersonal control negatively predicted mid-season engagement. Although the aforementioned studies are regarded as longitudinal studies, they did not take advantage of many of the strengths that come with having a longitudinal design. Some of the primary advantages are the repeated measurements of all study variables to assess temporal ordering of the variables and the possibility to not only assess groups’ mean score changes or between-person differences but also within-person changes (Stenling, Ivarsson, & Lindwall, 2016a, 2016b).

There have been a few studies examining longitudinal associations between coaches’ interpersonal styles and athlete outcomes, which included repeated measurements of the study variables and, in some cases, also examined within-person change processes. In a sample of young gymnasts’, perceptions of an autonomy-supportive/mastery-oriented coach longitudinally predicted the athletes’ competence need satisfaction and was also indirectly related to higher self-esteem through competence need satisfaction (Kipp & Weiss, 2015). This study used a half-longitudinal design (Cole & Maxwell, 2003) where all study variables were measured at two time points (7 months apart). The predictions were estimated from the independent variables at time point 1 to the mediators at time point 2, as well as from the mediators at time point 1 to the dependent variables at time point 2. An advantage with the half-longitudinal design is the possibility to control for prior levels of the dependent variables or mediators, which is important because most often the strongest predictor of a dependent variable is the same variable measured at previous time points (Gollob & Reichardt, 1987). The underlying assumption in this model is that of stationarity, meaning the causal structure does not change. This assumption may or may not hold, but it cannot be tested with only two waves of data. Although this two-wave half-longitudinal design is stronger than cross-
sectional designs and prospective predictions, Kipp and Weiss (2015) only examined the process from coaches to athletes, that is, as something the coach does to the athletes and not as a relationship between the coach and the athlete (cf. Ehrhart & Klein, 2001; Shamir, House, & Arthur, 1993). Hence, Kipp and Weiss (2015) did not examine the temporal ordering of variables (e.g., reciprocal relations) and did not examine within-person changes.

Researchers have also examined the longitudinal associations between young athletes’ perceived autonomy support from the coach, peer-created task-involving motivational climate, and intrinsic motivation toward sports (Jõessar, Hein, & Hagger, 2012). The longitudinal associations between autonomy support and the motivational climate at two time points (one year apart) were examined using a cross-lagged panel model (CLPM; Stenling et al., 2016a), whereas intrinsic motivation was measured only at time point 2. Perceived autonomy support from the coach and the peer-created task involving climate longitudinally predicted higher levels of intrinsic motivation. A closer look at the reciprocal relations between autonomy support and task-involving climate showed that perceived autonomy support positively predicted a peer-created task-involving climate one year later, but not vice versa. These findings suggest that autonomy-supportive coaching over time might be beneficial for creating a peer-climate characterized by social support, a focus on effort, and individual improvement. Although the CLPM takes into account prior levels of the dependent variables and allows for the possibility to examine reciprocal relations, in a two-wave model, it is difficult to assess temporal causality, reciprocal causation, or stationary effects (Cole & Maxwell, 2003; Jang, Kim, & Reeve, 2012), given that only one time lag is available. With more measurement points, researchers can examine in more detail what drives what over time (temporal causality), reciprocal effects and feedback loops (reciprocal causation), and stationary effects, that is, are the effects stable over time. The CLPM has also received critique due to its failure to adequately separate the within-person and between-person level in the presence of time-invariant, trait-like individual differences. As a consequence, the lagged parameter estimates are confounded by the relationship that exists at the between-person level and will not reflect the actual within-person mechanism (Hamaker, Kuiper, & Grasman, 2015).

Another way to longitudinally examine the dynamic coach–athlete relationship is to employ a diary study (Bolger & Laurenceau, 2013) and use longitudinal multilevel modeling (MLM; Raudenbush & Bryk, 2002) to separate between-person and within-person effects. In one such diary study the four-stage motivational sequence was examined at the situational level by having young gymnasts (7 to 18 years) complete short questionnaires before and after 15 practices spanning a 4-week period (Gagné et al., 2003).
Perceived autonomy support and involvement from coaches (and parents) were assessed only at baseline, whereas athletes’ daily autonomous and controlled motivation were assessed before each practice, and daily need satisfaction and well-being were assessed before and after each practice. The between-person analyses showed that perceptions of coach autonomy support were positively related to need satisfaction and autonomous motivation, whereas aggregate levels of incoming motivation before practice and need satisfaction during practice did not have a statistically significant influence on changes in well-being. Perceived autonomy support from the coach was also related to higher levels of autonomous motivation at the within-person level, and coaches’ involvement was positively related to higher and stable self-esteem during practice. Furthermore, incoming autonomous motivation positively predicted well-being before practice but not changes in well-being during practice. Need satisfaction during practice, however, had an overriding effect on change in well-being during practice. In line with the classic Simpson’s paradox (Simpson, 1951; see also Kievit, Frankenhuis, Waldorp, & Borsboom, 2013), Gagné et al. (2003) showed how results may differ depending on the level of analysis, that is, whether the measure is at the between-person or within-person level. It also provided evidence of the influence of situational variability in need satisfaction on athletes’ well-being. This study, however, did not assess changes in coaches’ interpersonal styles, did not assess the temporal ordering of the variables, only included female athletes in a wide age range (7 to 18 years), and the authors suggested that more studies on the four-stage motivational sequence are needed in more mature samples, including male athletes, and with larger samples. The shortcomings highlighted by Gagné et al. (2003) will, at least to some extent, be addressed in the present thesis.

In a sample of male youth soccer players, between-person and within-person effects of perceived coach autonomy support on athletes’ need satisfaction and well- and ill-being were examined across two competitive seasons (Adie et al., 2012). The study variables were assessed in the beginning, middle, and end of both seasons, and MLM (Singer & Willet, 2003) was used to separate between-person differences and within-person changes. As predicted by BPNT (Ryan & Deci, 2002), perceived coach autonomy support positively predicted between-person differences and within-person changes in the needs for autonomy, competence, and relatedness over the two seasons. Coach autonomy support positively predicted between-person differences and within-person changes in athletes’ well-being and negatively predicted between-person-differences in exhaustion. Finally, an indirect effect from perceived coach autonomy support to within-person changes in well-being through the needs for competence and relatedness was also found. Overall, perceived coach autonomy support was more consistently related to well-being, as measured
by subjective vitality, than exhaustion. Similar to previous studies (e.g., Gagné et al., 2003), Adie et al. (2012) included a rather narrow sample (male youth soccer players), did not assess the temporal ordering of the variables (e.g., reciprocal associations), and used the heavily criticized causal steps approach (Baron & Kenny, 1986) to examine indirect effects, which is no longer a recommended method to assess mediation (cf. Preacher, 2015; Rucker, Preacher, Tormala, & Petty, 2011).

Two recent studies also used MLM to examine the between-person differences and within-person changes in athletes’ perceptions of coaches’ interpersonal styles and how coaches’ interpersonal styles were related to athletes’ ill- and well-being (Bartholomew et al., 2011; Taylor, Turner, Gleeson, & Hough, 2015). Across 8 training days spanning a period of 2 weeks, athletes’ (15 to 25 years) perceptions of an autonomy-supportive interpersonal style positively predicted need satisfaction and negatively predicted need thwarting at the between- and within-person levels. Perceptions of a controlling interpersonal style negatively predicted need satisfaction at the between-person level, but not at the within-person level, and positively predicted need thwarting at both the between-person and within-person level. Need satisfaction and thwarting was in turn differentially related to self-reported ill- and well-being (Bartholomew et al., 2011). In another study, researchers focused on the association between perceptions of coaches’ interpersonal style and mucosal immunity measured by salivary secretory immunoglobulin A (SIgA; Taylor et al., 2015). Elevated levels of SIgA are indicative of immune disturbances and an increased risk for infection, for example, caused by exposure to stressful events. The study spanned over a period of 2 months and three measurement points, and it was found that within-person changes in field hockey players’ perceptions of interpersonal control from the coach positively predicted higher levels of SIgA, but this association was not found at the between-person level. Hence, this study provided novel evidence that coaches’ controlling interpersonal style might elevate athletes’ risk for infections. This study did not establish causal effects but did, however, provide evidence for the link between coaches’ interpersonal styles and ill-being beyond the commonly used self-report questionnaires. Although assessing changes in coaches’ interpersonal styles over a short period of time (2 weeks to 2 months) and separating between- and within-person effects, these two studies did not examine the temporal ordering of the variables. Furthermore, in the study of Taylor and colleagues (2015), the rather narrow sample of field hockey players competed at the regional level (i.e., were not elite athletes), which might explain the lack of association at the between-person level. A sample of elite athletes who are more invested in their sport might be more appropriate to examine such between-person differences (Taylor et al., 2015).
The results from these longitudinal studies display a fairly consistent pattern of positive outcomes associated with perceived autonomy support and negative outcomes associated with coaches’ controlling interpersonal styles. Furthermore, the separation of between-person and within-person associations provides a more nuanced picture of how variables are related compared to single-level analyses not separating between-person and within-person effects. These studies also show that the theoretical predictions within SDT must be further specified (e.g., separate predictions for the between-person and within-person level) as the evidence accumulates from multi-level studies. Also, none of these longitudinal studies examined the temporal ordering of the SDT variables (e.g., reciprocal or reversed associations between coaches’ interpersonal styles, basic psychological needs, and motivation), and none of them examined changes in the entire four-stage motivational sequence. In the present thesis, I address some of the aforementioned shortcomings of previous longitudinal research (e.g., temporal ordering and within-person changes).

**Intervention studies**

Research on the effectiveness of interpersonal coach education interventions on athlete outcomes is scarce in the sport psychology literature. In a recent systematic review, only four intervention studies were found that met the inclusion criteria, and none of the studies were grounded in SDT (Langan, Blake, & Lonsdale, 2013). SDT-based coach interventions were, however, identified as a promising area for future research due to their usefulness to explain the influence that coaches can have on athletes as well as the mechanisms involved in this process. SDT-based interventions have shown promising results in a variety of domains, such as educational settings (Cheon, Reeve, & Moon, 2012; Cheon & Reeve, 2013), exercise promotion (Teixeira et al., 2012), obesity interventions (Teixeira et al., 2015), physiotherapists’ need-supportive behaviors (Murray et al., 2015), and for reducing tobacco dependence (Pesis-Katz, Williams, Niemiec, & Fiscella, 2011).

There has also been a recent increased interest in SDT-based interventions in sports settings focusing on autonomy-supportive training for sports coaches that show somewhat mixed results. Two autonomy-supportive interventions found no statistically significant effects on youth sports coaches’ behaviors or on athletes’ perceptions of coaches’ interpersonal styles, need satisfaction and need thwarting, motivation, or mental toughness (Langdon, Schlote, Harris, Burdette, & Rothberger, 2015; Mahoney, Ntoumanis, Gucciardi, Mallett, & Stebbings, 2016). The lack of effects in these two interventions can be attributable to several factors, such as the focus on in-game situations, lack of opportunities to practice new behaviors, and nonadherence to the online modules (Langdon et al., 2015),
and misinterpretation of the workshop content, relevance to the sport, time demands, and other contextual constraints (Mahoney et al., 2016). Another factor that probably influenced these interventions is the few and relatively short group-based workshops that the coaches attended. Although both interventions followed the recommendations provided by Su and Reeve (2011), only providing one 1-hour workshop (Langdon et al., 2015) or two 2-hour workshops within a week (Mahoney et al., 2016) is probably not enough for sustained behavior change, regardless of the quality of additional educational material provided to the participants.

Two other intervention studies can be considered more successful, as changes in target behaviors and more distal athlete outcomes were observed. In youth Gaelic football coaches, an autonomy-supportive intervention increased coaches’ need supportive interpersonal style and decreased their controlling interpersonal style (Langan, Blake, Toner, & Lonsdale 2015). While burnout symptoms and amotivation increased among athletes in the control group, no such increase was observed among the athletes in the experimental group. Instead of group-based workshops, the intervention spanned over 12 weeks and consisted of six one-on-one meetings where previous coaching sessions were reviewed, coaches reflected upon their experiences implementing the new strategies, and new goals were set (Langan et al., 2015). These findings suggest that coaches’ autonomy support can prevent increases in athlete burnout over the course of a season, which might have long-term consequences for athletes’ performance and well-being. Finally, following previous successful autonomy-supportive intervention programs in the educational domain, one SDT-based intervention has been performed in a high-stakes competitive sport context with participants in the 2012 London Paralympic Games (Cheon, Reeve, Lee, & Lee, 2015). The intervention showed consistent effects across athletes’ and coaches’ self-reports, rater-scores, and objective dependent measures. A longitudinal deterioration was observed for athletes and coaches in the control group on all measures of coaches’ interpersonal styles, need frustration and satisfaction, and engagement. Athletes and coaches in the experimental group maintained or increased their levels on all measures of coaches’ interpersonal styles, need frustration and satisfaction, and engagement. Athletes in the experimental group also won more medals compared to athletes in the control group. The authors concluded that an autonomy-supportive coaching style can function as an antidote to coaches’ otherwise situationally-induced controlling style.

Similar to the conclusions drawn from reviewing the cross-sectional and longitudinal studies, evidence from the intervention studies provides initial support for the effectiveness of coach interventions based on SDT. But the results in these studies display mixed results and also display potential barriers that researchers must take into consideration when designing
autonomy-supportive training programs. Challenges and opportunities of an autonomy-supportive approach to sports coaching have been highlighted in the literature as an important avenue for future research (Occhino, Mallett, Rynne, & Carlisle, 2014). This call has also gained some attention, for example, by Langan et al. (2015) and Mahoney et al. (2016), who examined the feasibility and acceptability of their interventions using follow-up interviews with the participants. Some have also interviewed coaches to gain more insight into the positive aspects and the challenges of autonomy-supportive training programs (Langdon, Harris, Burdette, & Rothberger, 2015). Non-traditional study designs can probably be useful to further uncover the potentials and barriers of SDT-based coach education programs, such as action research methodology (Ahlberg, Mallett, & Tinning, 2008) and single-case behavioral interventions (Davidson, Peacock, Kronish, & Edmonson, 2014; Sousa, Smith, & Cruz, 2008). Another area with potential to uncover facilitating and hindering factors in SDT-based interventions is the transfer of training literature, which has been theoretically suggested (Dysvik & Kuvaas, 2014) and empirically examined in a recent study (Stenling & Tafvelin, 2016). With their transfer of the training model, Baldwin and Ford (1988) proposed a conceptual framework focusing on individual, training design, and work environment factors that influence peoples’ ability to acquire new knowledge and skills as well as the maintenance of these over time. SDT provides a theoretical framework that can specify important individual (e.g., need satisfaction, motivation), training design (e.g., need-supportive delivery, goal content), and work environment (e.g., need-supportive work environment) factors hindering or facilitating transfer of training.

Antecedents of Coaches’ Interpersonal Styles
Whereas most of the SDT-based research in sports settings has focused on the impact of coaches’ autonomy-supportive and controlling interpersonal styles on athlete outcomes, there is a dearth of research on antecedents to coaches’ interpersonal styles (Ntoumanis, 2012; Occhino et al., 2014). Mageau and Vallerand (2003) proposed three broad factors of antecedents to coaches’ interpersonal styles—coach’s personal orientation, coaching context, and perceptions of athletes’ behaviors and motivation—and the research so far in sports settings has almost exclusively focused on the coaches’ perspective (i.e., coaches’ self-reports). Cross-sectional associations have been found between coaches’ self-reported autonomy-supportive and controlling interpersonal styles and harmonious and obsessive passion, respectively (Lafrenière, Jowett, Vallerand, & Carbonneau, 2011). Perceived pressure in the coaching environment has been negatively linked to autonomy support (Iachini, 2013), whereas perceptions of athletes’ self-determined motivation were positively associated with autonomy support.
(Rocchi, Pelletier, & Couture, 2013). Perceived unity among athletes’ and coaches’ self-determined motivation have been positively linked to coaches’ self-reported autonomy support (Solstad, van Hoye, & Ommundsen, 2015). Narcissism has been positively related to coaches’ controlling behaviors, and empathic concerns negatively related to controlling behaviors and positively related to autonomy support (Matosic et al., 2015). Self-reported autonomy support has further been positively associated with perceptions of resources in the coaching context, need satisfaction, and self-reported well-being, whereas controlling behaviors have been positively associated with perceptions of demands in context, need thwarting, and ill-being (Stebbings, Taylor, & Spray, 2011; Stebbings, Taylor, Spray, & Ntoumanis, 2012). These latter findings have also been replicated in a three-wave longitudinal study showing that between-person differences and within-person changes in positive affect and integration of coaching into oneself positively predicted coaches’ self-reported autonomy support. Self-reported interpersonal control was positively associated with between-person differences and within-person changes in negative affect (Stebbings, Taylor, & Spray, 2015).

Most SDT-based research on coaches’ interpersonal styles has focused on athletes’ perceptions; therefore, it is also important to examine antecedents to athletes’ perceptions of coaches’ interpersonal styles, which to a large extent have been neglected in the SDT literature. Given the focus within SDT on the psychological meaning that people ascribe to contextual factors (Deci & Ryan, 1987; Soenens, Vansteenkiste, & Van Petegem, 2014), such as coaches’ interpersonal styles, factors that influence peoples’ perceptions become an important source of information for understanding the coach–athlete relationship. Although this has not been given much attention in sport psychology research, research in the educational domain suggests that student characteristics are important determinants of teachers’ interpersonal styles. Skinner and Belmont (1993) found that teachers’ autonomy support and provision of structure longitudinally predicted students’ engagement across the school year. Reciprocal effects of students’ engagement on teachers’ need-supportive interpersonal styles were also found. These findings have more recently been replicated, showing that students’ need satisfaction (Jang et al., 2012) and agentic engagement (Reeve, 2013) longitudinally predicted their perceptions of teachers’ autonomy support. It was proposed that teachers likely adjust their classroom motivating styles to students’ motivation and engagement. Students are likely to pick up on teachers’ movement towards greater autonomy support when student autonomy is high and also on teachers’ movement toward lesser autonomy support (and more teacher control) when student autonomy is low (Jang et al., 2012; Skinner & Belmont, 1993). Reeve (2013) suggested that these findings show the importance of interpersonal synchrony (in this case, student-teacher synchrony), which is a defining characteristic of most high-
quality relationships. In a further attempt to understand these complex and reciprocal relationships over time, Jang, Kim, and Reeve (2016) examined a dual-process model, including adaptive (perceived teacher autonomy support, student need satisfaction, and engagement) and maladaptive (perceived teacher control, student need thwarting, and disengagement) processes. They found general support for the adaptive and maladaptive processes from perceived teacher interpersonal styles to engagement/disengagement. Reciprocal associations, however, were only found for the maladaptive process where student disengagement negatively predicted perceived teacher autonomy support and positively predicted teacher control.

Research findings from work and organizational psychology corroborate the findings from the SDT-based research in the educational domain and suggest that follower characteristics are important factors influencing leadership perceptions (e.g., Bono, Hopper, & Yoon, 2012). Empirical studies have shown that follower values and personality predicted leadership preferences for charismatic leadership (Ehrhart & Klein, 2001) and that follower developmental characteristics—a composite variable of self-actualization needs, internalization of moral values, collectivistic orientation, critical-independent approach, active task engagement, and self-efficacy—negatively predicted perceptions of transformational leadership over time among direct followers (Dvir & Shamir, 2003). Follower personality (Felfe & Schyns, 2010) and well-being (Nielsen, Randall, Yarker, & Brenner, 2008) have also been found to predict perceptions of transformational leadership.

Although these findings support the notion that follower characteristics influence leadership perceptions, the dominating line of research in the field of leadership in general has been focused on the effectiveness of leaders’ behaviors with regard to different outcome criteria (e.g., follower outcomes; Avolio, 2007), which have been labeled a leader-centric approach (Felfe & Schyns, 2010). This leader-centric approach has also dominated leadership research in sport psychology (Ntoumanis, 2012; Occhino et al., 2014). Many scholars (e.g., Hall & Lord, 1995; Hollander, 1993; Howell & Shamir, 2005; Yukl & Van Fleet, 1992), however, agree that leadership is a dynamic process jointly produced by leaders and followers. Several scholars (e.g., Meindl, 1990, 1995) have also criticized the leader-centric approach and concluded that few have attempted to empirically assess and theoretically specify the role of followers in the leadership process (Howell & Shamir, 2005). As stated by Yukl and Van Fleet (1992), “Most of the prevailing leadership theories have been simple, unidirectional models of what a leaders does to subordinates” (p. 186). Later Lord, Brown, and Freiberg (1999) added, “the follower remains an under-explored source of variance in understanding leadership processes” (p. 167). Although these quotes date back two decades and primarily refer to the work and organizational literature, they are
equally valid today in sport psychology research in general and in SDT-based sport psychology research in particular.

There are several potential explanations as to why athlete characteristics will influence leadership perceptions. In line with the propositions in the mediational model of leadership (Smoll et al., 1978), researchers have emphasized the role of individuals’ perception and attribution of meaning to others’ interpersonal styles (Deci & Ryan, 1987; Soenens et al., 2015). How other peoples’ behaviors are appraised is in turn influenced by individual characteristics, and within the SDT literature, it has been proposed that peoples’ sensitivity to different interpersonal styles might vary depending on their motivational profiles (De Meyer et al., 2016; Soenens et al., 2015). One potential mechanism related to this sensitivity could be a process of sensitization and desensitization (Moller, Deci, & Elliot, 2010). More specifically, people with a history of need satisfaction are more sensitive and more receptive to new opportunities for need satisfaction. Conversely, people with a history of need frustration/thwarting would be less sensitive to opportunities for need satisfaction and might even be more sensitive to need frustrating/thwarting events, which might increase the deleterious effects of such need frustrating/thwarting events and lead to maladaptive outcomes. Following this line of reasoning, athletes higher in autonomous motivation, which likely have experienced more need satisfaction in the past, would benefit more from coaches’ autonomy support. On the contrary, athletes higher in controlled motivation and amotivation, who likely have experienced more need frustration/thwarting in the past, would benefit less from coaches’ autonomy support and might even be more sensitive and receptive to coaches’ controlling behaviors, leading to more negative consequences (De Meyer et al., 2016).

Another potential explanation is centered on the idea of interpersonal synchrony between for example coaches and athletes. Based on research in the educational domain, the student-teacher relationship was suggested to be characterized by reciprocal causation (Jang et al., 2012; Reeve, 2013, 2015). That is, what one person says and does transforms what the other says and does, and vice versa (Sameroff, 2009). Following this line of reasoning, coaches’ autonomy support will lead to greater need satisfaction and autonomously regulated behaviors in athletes that, in turn, will increase coaches’ autonomy support. Such a positive upward spiral can produce benefits for both partners, and they become motivational and environmental assets for each other. If coaches instead rely on interpersonal control, athletes are likely to experience need thwarting and maladaptive behaviors driven by controlled motivation that, in turn, will increase coaches’ controlling behaviors. The two partners thus become motivational and environmental liabilities to each other. This latter negative downward spiral shifts relationships toward unidirectional causality instead of a mutually
supportive relationship because the relationship becomes characterized by coaches shutting down the athletes’ autonomy and agency (Reeve, 2015).

A recent study showed that physical education teachers believed that students with high controlled motivation would benefit most from a more controlling interpersonal style and that autonomy support would be most effective for students with high autonomous motivation. On the other hand, students reported the belief that teacher autonomy support would be most beneficial regardless of the students’ motivation (De Meyer et al., 2016). Similar findings have been reported among trainee sport and exercise students expressing the belief that obese individuals with high controlled motivation would benefit less from autonomy-supportive strategies (Ng, Thøgersen-Ntoumani, & Ntoumanis, 2012). These findings can also be linked to research showing that teachers interacted with students in a more controlling way when students were perceived as being less motivated (Sarrazin, Tessier, Pelletier, Trouilloud, & Chanal, 2006). It is likely that similar processes occur in the sport domain in that coaches’ expectations on and perceptions of athletes’ motivation as more autonomous or controlled will influence coaches’ levels of autonomy support and interpersonal control toward the athletes.

Lord and Maher (1991) suggested that leadership can be defined as a perceptual process within subordinates. It has also been suggested that cognitive categories used by followers will influence the impact that leaders have on subordinates and that followers’ self-identities serve as important cognitive structures in leadership perceptions (Lord et al., 1999). Several scholars have proposed that followers’ self-concepts play a central role for the impact that leaders have on followers (e.g., Howell & Shamir, 2005; Lord et al., 1999; Hall & Lord, 1995). Leaders’ effect on followers has been argued to depend upon their ability to appeal to existing elements of followers’ self-concepts, more specifically followers’ values and identities (Shamir et al., 1993). Hall and Lord (1995) proposed a multi-level information-processing framework to explain followers’ leadership perceptions and suggested that affective and cognitive information-processing mechanisms work at a variety of levels (person, dyad, and group) to determine followers’ perceptions of leaders. These affective (e.g., depression/anxiety) and cognitive (e.g., goals and motives) influences at the person level, which are of primary interest in the present thesis, can be characteristics that vary between persons (i.e., person-wholes) and/or vary within persons (i.e., person-parts). Between-person differences can, for example, be influenced by self-schemas that make people more likely to notice attributes and behaviors of others when those factors are included in their self-schema. Similar processes are suggested to operate at the within-person level, in that when followers’ cognitive characteristics, such as goals and motives, are congruent with situational cues, leader characteristics are subjected to more comprehensive processing.
The propositions within this information-processing framework (Hall & Lord, 1995) are compatible with Reeve’s (2013, 2015) and Jang et al.’s (2012) suggestions of interpersonal synchrony and upward and downward spirals, as well as the sensitization-desensitization process proposed by Moller et al. (2010) and De Meyer et al. (2016).

**Multidimensional Nature of Coaches’ Interpersonal Styles**

SDT-based research in competitive sports contexts has primarily focused on autonomy support (Ntoumanis, 2012). However, researchers in the educational psychology and parental literatures (e.g., Grolnick & Ryan, 1989; Skinner & Belmont, 1993) have suggested that it is also important to acknowledge the provision of structure and involvement in addition to autonomy-supportive and controlling interpersonal styles. Mageau and Vallerand (2003) also included coaches’ structure and involvement as important determinants of the satisfaction of athletes’ psychological needs for competence and relatedness in their motivational model of the coach–athlete relationship. A need-supportive interpersonal style, including autonomy support, structure, and involvement, have been examined in physical education settings (e.g., Haerens et al., 2013; Standage, Duda, & Ntoumanis, 2005; Taylor & Ntoumanis, 2007; Tessier, Sarrazin, & Ntoumanis, 2010) and exercise settings (e.g., Edmunds, Ntoumanis, & Duda, 2008; Markland & Tobin, 2010), but the potential role of perceived structure and involvement from coaches in sports is largely unexplored (Mageau & Vallerand, 2003; Ntoumanis, 2012; Wilson, Gregson, & Mack, 2009).

Structure involves providing clear and understandable guidelines and expectations, instilling a sense of competence in the athletes, and providing relevant feedback to the athletes (Reeve, 2002). Involvement is displayed when coaches show a genuine interest in their athletes and their well-being and spend a considerable amount of time, energy, and resources on them (Grolnick & Ryan, 1989). Ryan (1991) and others (e.g., Markland & Tobin, 2010; Niemiec et al., 2006) have argued that the three dimensions are highly interrelated and are therefore often combined into a broader category labeled “need support”. Research from the educational domain and parental literature, however, suggests that they are complementary interpersonal styles fostering motivation (Grolnick & Ryan, 1989; Jang, Reeve, & Deci, 2010; Niemiec et al., 2006; Reeve & Su, 2014).

Few studies have examined the role of structure and involvement from coaches in sports settings. One exception is Reinboth et al.’s (2004) cross-sectional study that showed positive associations between athletes’ perceptions of coach autonomy support, coach-created task-involving climate, and social support and autonomy, competence, and relatedness need satisfaction, respectively. Autonomy and competence need satisfaction was in turn related to indices of ill- and well-being. Reinboth and colleagues
did not, however, directly assess structure and involvement in line with SDT but instead relied on other theoretical frameworks (e.g., achievement goal theory).

A more recent study on university rugby players showed that a composite of need-supportive coaching, including autonomy support, provision of structure, and involvement, was positively associated with athletes’ need satisfaction, autonomous motivation, and effort (Pope & Wilson, 2012). The instrument assessing the three dimensions of need support—the Interpersonal Supportiveness Scale–Coach (ISS-C; Wilson et al., 2009)—was based on two previous instruments: the Health Care Climate Questionnaire (HCCQ; Williams, Grow, Freedman, Ryan, & Deci, 1996) measuring perceived autonomy support, and Tobin’s (2003) work on the provision of structure and involvement in the exercise domain. The lack of instruments to assess structure and involvement from coaches could be a potential explanation for the lack of research in sports settings. The ISS-C could therefore be a contribution to the SDT-based sport psychology research by providing a self-report instrument of athletes’ perceptions of coaches’ autonomy support, structure, and involvement. Although Wilson and colleagues (2009) provided some initial evidence for the factorial validity of the ISS-C, the authors called for additional studies on the congeneric nature of the three dimensions due to relatively strong correlations between the factors. Given the multidimensional nature of a need-supportive interpersonal style (e.g., Mageau & Vallerand, 2003; Ntoumanis, 2012) and the recent calls for more research on these various interpersonal styles in physical activity settings (Ntoumanis, 2012; Pope & Wilson, 2012; Standage, 2012), a comprehensive investigation of the multidimensionality in measures capturing coaches’ need support in sports contexts seems warranted.

A controlling interpersonal style has also recently been extended beyond the autonomy support versus control SDT-based work and has been conceptualized as a multidimensional construct. Following an extensive literature review, a number of controlling motivational strategies that coaches use were identified (Bartholomew et al., 2009, 2010). The most prominent strategy was controlling use of rewards, characterized by coaches using extrinsic rewards and praise to ensure athlete compliance, engagement, and persistence in certain behaviors. This controlling strategy has been closely linked to the undermining effect of rewards on intrinsic motivation (Deci et al., 1999; Vansteenkiste & Deci 2003), defined as a negative effect of tangible rewards on intrinsic motivation, particularly when the reward is expected. Verbal rewards and praise can also produce similar effects (Henderlong & Lepper 2002). Coaches can display negative conditional regard by withholding attention and affection when athletes do not display the desired attributes or behaviors (Assor, Roth, & Deci, 2004).
When coaches’ affection and attention are highly contingent upon athletes showing appropriate behaviors, coaches exhibit conditional regard. This often forces athletes to give up their autonomy to maintain the relationship with the coach (Bartholomew et al., 2010). Intimidation is an abusive and power-based controlling motivational strategy. It is used to belittle and humiliate through verbal abuse, to pose threats, and to control athletes’ behaviors through yelling (Bartholomew et al., 2010). Intimidation promotes external regulation and creates pressure from the outside, which makes athletes engage in certain behaviors to avoid external punishment (Deci & Ryan, 1987). A fourth strategy is excessive personal control, displayed when coaches engage in intrusive monitoring of athletes’ free time and impose strict limits (Bartholomew et al., 2010). When coaches restrict athletes’ free time (e.g., by setting curfews) or attempt to hinder them from engaging in other sports, coaches demonstrate excessive personal control. Such controlling interpersonal behavior promotes a sense of pressure from the coach to prioritize one’s sports involvement over other important aspects of the athlete’s life.

Bartholomew et al. (2010) developed the Controlling Coach Behaviors Scale (CCBS) to assess athletes’ perceptions of coaches’ controlling interpersonal styles and concluded “that a controlling interpersonal style is a multidimensional construct represented by a number of separate, but related, controlling coaching strategies” (p. 205). In a series of studies, the content and factorial validity, internal consistency, and measurement invariance across gender and sports were examined. More specifically, first- and second-order independent clusters model confirmatory factor analyses (ICM-CFA) were used to examine the factorial structure of the CCBS. The psychometric properties of the CCBS have also been examined in other studies (e.g., Castillo et al., 2014), but a comprehensive examination of the multidimensional nature of the CCBS has not yet been undertaken.

The interpersonal styles are multidimensional constructs, consisting of theoretically separable subdimensions, but they also reflect a global construct alongside these subdimensions. Such constructs contain two sources of psychometric multidimensionality—a global factor and specific subdimensions—and a comprehensive examination of the multidimensional structure needs to involve both sources (Morin, Arens, & Marsh, 2015). Many theory-based multidimensional scales correspond to a bifactor structure consisting of a global construct (e.g., need support) as well as specific subdimensions (e.g., autonomy support, structure, and involvement), which means that there are two sources of construct-relevant variance (Myers, Martin, Ntoumanis, Celimli, & Bartholomew, 2014). Although multidimensional scales often correspond to a bifactor structure, they are rarely examined with bifactor measurement models in the sport and exercise psychology literature. This is unfortunate because bifactor models
can provide researchers with an opportunity to match the theory behind an instrument with the model imposed on the data when evaluating multidimensional scales. This theory-model match is lacking when the commonly used first- or second-order ICM-CFA is applied, because no direct influence from the global construct to the indicators is estimated (Myers et al., 2014).

**Purpose and Research Questions**

The aim of this thesis is to increase our knowledge of the leadership process in sports from an SDT perspective, particularly how coaches’ autonomy-supportive and controlling interpersonal styles are longitudinally associated with young athletes’ motivation and ill- and well-being. By complementing the dominating leader-centric perspective (i.e., that leadership is something that leaders impart on their followers), with a follower-centered perspective (i.e., in which leadership is defined as a process jointly produced by both the leader and the follower; Deci & Ryan, 1985, 1987; Hollander, 1992), it is possible to gain increased insight into the role of followers in the dynamic and interactive leadership process (Howell & Shamir, 2005; Lord & Emrich, 2000; Ntoumanis, 2012; Occhino et al., 2014). Grounded in SDT (Deci & Ryan, 1985, 2000), Study 1 and Study 2 examined the longitudinal associations between athletes’ perceptions of coaches’ autonomy-supportive and controlling interpersonal styles and athletes’ need satisfaction, motivation, and ill- and well-being. In the first study, an adaptive motivational process was examined (i.e., longitudinal associations between autonomy support, need satisfaction, self-determined motivation, and well-being), whereas the second study focused on a maladaptive process (i.e., longitudinal associations between perceptions of coaches’ controlling behaviors, controlled motivation, and ill-being). Study 3 moved beyond the unidimensional view on autonomy support versus controlling behaviors and examined multidimensionality in sport-specific measures of athletes’ perceptions of coaches’ interpersonal styles (i.e., need-supportive and controlling behaviors). Four overarching research questions are addressed in the three studies:

I. Are there longitudinal associations between levels of, and within-person changes in, perceived autonomy support, need satisfaction, self-determined motivation, and well-being over the course of an athletic season? (Study 1).

II. Are athletes’ perceptions of controlling coach behaviors longitudinally associated with controlled motivation and ill-being at the between-person level? (Study 2).
III. Do athlete characteristics, in terms of controlled motivation and ill-being, predict athletes’ perceptions of controlling coach behaviors at the within-person level? (Study 2).

IV. Are there distinct sources of construct-relevant psychometric multidimensionality in measures of coaches’ need-supportive and controlling behaviors? (Study 3).

**Materials and Methods**

The studies contain data collected in three different populations of young athletes, including both individual and team sport athletes. An overview of the study designs, participants, instruments, and statistical analyses used in three studies are provided in Table 1. The project was approved by the Regional Ethical Review Board at Umeå University prior to the data collections.

**Samples and Procedures**

The samples in Study 1 and Study 2 initially comprised 247 (109 females, 138 males) young elite athletes (alpine skiers, biathletes, cross-country skiers) enrolled at one of 18 sport high schools in Sweden. These sport high schools provide young athletes the opportunity to combine high-level training with an academic schedule arranged around their sporting activities. The age range in the sample was 16 to 20 years (M = 17.8, SD = 0.9). They practiced on average 12.5 hours (SD = 3.6) per week and competed in their sport for an average of 9.7 years (SD = 3.1). Most athletes (96%) competed at the national or international level. Data were collected via post at three time points during a competitive season, in November (T1), January (T2), and April (T3), with approximately 2.5 months between each data collection. At T2, 178 athletes responded to the multi-section questionnaire, and 164 athletes responded at T3.

The two samples in Study 3 included young team sport athletes (floorball, ice hockey). The first sample (Study 3a) comprised 277 (142 female, 135 male) floorball players ranging in age from 15 to 22 years (M = 16.8, SD = 1.1). They had on average been competing in floorball for 8.4 years (SD = 2.8) and practiced on average 6.8 hours (SD = 3.4) per week. The second sample (Study 3b) consisted of 233 young male ice hockey players aged 15 to 20 years (M = 17.1, SD = 1.4) who on average had been competing in their sport for 10.6 years (SD = 2.1). Data were collected by a research assistant who visited each team and provided the athletes with verbal and written information about the study purpose before commencing the data collection.
**Measures**
We relied on previously used and validated self-report instruments to assess the study variables. A summary of the instruments used in the three studies and references to the original sources are provided in Table 1.

**Data Analysis**
Structural equation modeling (SEM; see Bollen, 1989; Hoyle, 2012) was used to analyze the data in the three studies. Excellent reviews of the strengths and limitations of SEM can be found elsewhere (MacCullum & Austin, 2000; Marsh & Hau, 2007; Tomarken & Waller, 2005); I will nevertheless briefly summarize the history of SEM and some of its key strengths and limitations. SEM has become the most used multivariate technique among psychologists (Hershberger, 2003), and its increased popularity can, for example, be illustrated by the establishment of a journal solely devoted to it (Structural Equation Modeling: A Multidisciplinary Journal). There is also a widespread use of SEM in contemporary sport and exercise psychology research (Lindahl et al., 2015). In psychology, Pearson (1901) and Spearman (1904) published early papers on factor analysis, work later continued and expanded by Thurstone’s (1935, 1947) correlated factor-model and Holzinger and Swinford’s (1937) bifactor measurement model. Important work that laid the foundation for contemporary SEM was conducted in various fields, such as sociology, statistics, and econometrics during the 20th century, but 1970 is often referred to as a key year in SEM history. During 1970, seminal work on SEM was published and publicly presented, such as Jöreskog’s (1970) general method of analyzing covariance structures, Hauser and Goldberger’s (1971) work on unobservable variables in path analysis, and Zellner’s (1970) generalized least squares (GLS) results on unobservable independent variables. The Conference on Structural Equation Models was also held for the first time this year, providing an interdisciplinary forum for SEM researchers, which resulted in the volume Structural Equation Models in the Social Sciences (Goldberger & Duncan, 1973). Two particularly influential papers were published during this time. The first was Jöreskog’s (1973) paper on his maximum likelihood (ML) framework for estimating SEM, accompanied by a computer software (LISREL) for empirical applications, and various substantive extensions of SEM. The second paper was Hauser and Goldberger’s (1971) integrative approach, bringing together work from econometrics, psychometrics, sociology, and statistics to examine unobservable variables in path analysis. Continuing this line of work, Jöreskog (1970, 1973, 1978) outlined a general approach to covariance analysis in a model (i.e., the LISREL model) that incorporates factor analysis, simultaneous equation models, and path analysis into a general covariance structure model.
### Table 1

**Overview of the Three Studies**

<table>
<thead>
<tr>
<th>Study 1</th>
<th>Study 2</th>
<th>Study 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>To examine longitudinal associations between levels of, and within-person changes in, perceived coach autonomy support, athletes' need satisfaction, self-determined motivation, and well-being.</td>
<td>To examine longitudinal associations between athletes' controlled motivation, ill-being, and perceptions of coaches' controlling behaviors at the between- and within-person levels.</td>
</tr>
<tr>
<td><strong>Design</strong></td>
<td>Longitudinal (two time points)</td>
<td>Longitudinal (three time points)</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
<td>Young elite athletes $N_{T1} = 247; N_{T2} = 164$</td>
<td>Young elite athletes $N_{T1} = 247; N_{T2} = 178; N_{T3} = 164$</td>
</tr>
<tr>
<td><strong>Variable</strong></td>
<td><strong>Coaches’ autonomy support</strong></td>
<td><strong>Coaches’ controlling interpersonal style</strong></td>
</tr>
<tr>
<td><strong>Instrument</strong></td>
<td>Sport Climate Questionnaire (SCQ; Smith, Ntoumanis, &amp; Duda, 2007)</td>
<td>Coaches Controlling Behaviors (Smith et al., 2010)</td>
</tr>
<tr>
<td><strong>Need satisfaction</strong></td>
<td>Basic Need Satisfaction in Sport Scale (BNSSS; Ng, Lonsdale, &amp; Hodge, 2011)</td>
<td>Behavioral Regulation in Sport Questionnaire (BRSQ; Lonsdale, Hodge, &amp; Rose, 2008)</td>
</tr>
<tr>
<td><strong>Self-determined motivation</strong></td>
<td>Behavioral Regulation in Sport Questionnaire (BRSQ; Lonsdale, Hodge, &amp; Rose, 2008)</td>
<td></td>
</tr>
<tr>
<td><strong>Well-being</strong></td>
<td>General Health Questionnaire (GHQ-12; Goldberg et al., 1997)</td>
<td>General Health Questionnaire (GHQ-12; Goldberg et al., 1997)</td>
</tr>
</tbody>
</table>
There has been a rapid development since the 1970s, and now the SEM framework includes models with discrete, limited, and ordinal dependent variables (Muthén, 1984), latent growth curve models (LGCM; Bollen & Curran, 2006; Meredith & Tisak, 1990), latent class analysis (e.g., Nagin, 2005), growth mixture models (Muthén, 2004), Bayesian approaches (e.g., Muthén & Asparouhov, 2012; Scheines, Hoijtink, & Boomsma, 1999; Zellner, 1971), and multilevel SEM (Muthén & Asparouhov, 2011; Rabe-Hesketh, Skrondal, & Pickles, 2004).

One reason for the increasing popularity of SEM is its many advantages compared to other data-analytic techniques. In latent variable models, it is possible to obtain separate estimates for the latent constructs and their observed manifest indicators (i.e., measurement model) and the relations between the latent constructs (i.e., structural model). This approach allows researchers to partial out the “true score” of an estimate and the measurement error, implying that specified relations in a SEM model are corrected for biases attributable to random error and construct-irrelevant variance (Tomarken & Waller, 2005). It is also possible to obtain a global assessment of fit for complex models containing several linear equations and to make model comparisons between nested models of varying complexity using a chi-square test or other fit indices (West, Taylor, & Wu, 2012).

Another commonly used pro-argument for SEM is that it allows for estimating complex models in a single analysis, in contrast to other multivariate techniques (e.g., multivariate regression), which makes it possible to estimate direct, indirect, and/or moderated effects in one analysis, rather than testing mini-parts of the model in separate analyses. Furthermore, SEM can handle nominal, binary, categorical, count, continuous variables, and various combinations of different types of variables, as well as variable-centered and person-centered approaches (Muthén, 2002). Missing data are easily handled in most SEM software, where full information maximum likelihood (FIML) estimation is often the default for continuous variables, but multiple imputation and the inclusion of auxiliary variables are also easily implemented in SEM (Enders, 2010).

Recent developments also include techniques to handle data that are missing not at random (MNAR) by incorporating the missingness patterns directly into the latent variable model (e.g., Enders, 2011; Muthén, Asparouhov, Hunter, & Leuchter, 2011). Finally, the flexibility in SEM makes it useful for various types of designs, including, for example, psychometric testing, longitudinal studies, cohort studies, intensive diary studies, intervention studies, and multilevel data.

As with all statistical analyses, there are limitations with SEM, which often has more to do with researchers applying SEM than the data-analytic technique itself. There has been an overreliance on the use of rules of thumb when researchers decide whether the model fits the data (Marsh & Hau,
Rules of thumb regarding sample size, indicators per factor, and particularly the use of goodness of fit indexes have turned into “golden rules,” much like the (mis)use of the $p$ value in psychological research (see Ivarsson, Andersen, Stenling, Johnson, & Lindwall, 2015). Many of these commonly applied rules of thumb have little empirical support, and several scholars (e.g., Marsh et al., 2004) have emphasized that “data interpretations and their defense is a subjective undertaking that requires researchers to immerse themselves in their data, methodological issues and substantive concerns” (Marsh & Hau, 2007, pp. 159–160).

Tomarken and Waller (2005) argued that using statistical analyses or other means to prove that a model is correct is impossible. Alternative models may be available that fit the data equally well or better. This is unfortunately often ignored by researchers, and there seems to be an overstated certainty and strength related to the conclusions drawn from SEM analyses. Although nested model comparisons are sometimes conducted, these are often conducted on a small subset of possible comparisons. Others have put forward similar critiques arguing that there seems to be an overreliance on conclusions drawn from single studies and that more attention should be given to the generalizability of findings from studies applying SEM (MacCallum & Austin, 2000). A related critique is the use of data-driven model modifications, which may lack validity (MacCallum, 1986) and are highly susceptible to capitalization on chance (MacCallum, Rzonowski, & Necowitz, 1992). Data-driven modifications to the model should be explicitly acknowledged as exploratory and data-driven, the modifications should be substantively meaningful, and the modified model should be evaluated in an independent sample. Although models subjected to data-driven modifications are sometimes acknowledged as exploratory and can be meaningful, they are seldom evaluated in an independent sample (MacCallum & Austin, 2000).

Although SEM is highly flexible, it cannot compensate for limitations in design and method (Tomarken & Waller, 2005). As noted by Box and Draper (1987), “Essentially, all models are wrong, but some are useful” (p. 424), or stated differently, all models are approximations and some can be useful approximations. This quote fits nicely within the SEM context, where it is possible to specify highly complex causal structures and obtain global assessment of fit and parameter estimates that researchers interpret based on the $a$ priori determined model. Just because researchers can specify a causal structure does not, however, mean that a causal relation can be inferred (Bollen & Pearl, 2013). Causal inference does not reside in the statistical model; it is something that is inferred by designing studies that allow researchers to draw causal inferences (Shadish, Cook, & Campbell, 2002). Another common design flaw when applying SEM is the use of
mediational models on cross-sectional data (Tomarken & Waller, 2005). It is well known that cross-sectional mediation typically yields substantively biased estimates, even under ideal conditions (Cole & Maxwell, 2003; Maxwell & Cole, 2007). Researchers interested in mediational processes should collect multiple waves of data and pay close attention to the appropriate time lag for the phenomena under study (Maxwell & Cole, 2007).

To summarize, SEM is a useful technique that can incorporate latent variables (i.e., unobserved variables), which are common in psychological research. Some scholars even argue that “a psychological variable is latent until proven observed” (Boorsboom, 2008, p. 49). This feature, in combination with the flexibility of SEM, makes it an attractive data-analytic approach for researchers in the social sciences. SEM is not, however, a statistical magical bullet, and researchers applying SEM must be aware of its strengths, limitations, and pitfalls, which have been known to methodologists for a long time (Tomarken & Waller, 2005). As previously emphasized, it is important to acknowledge and accept the subjective nature of data analysis and not rely on “golden rules” that lack empirical support (Marsh & Hau, 2007).

**Study 1: Latent difference score modeling**

In Study 1, a latent difference score (LDS) model (McArdle & Nesselroade, 1994; Selig & Preacher, 2009; Wu, Selig, & Little, 2013) was specified to estimate associations of within-person changes in the study variables. In the LDS model, change is explicitly specified as a latent variable ($\Delta Y$) and is defined by a linear function between two consecutive time points ($Y_t - Y_{t-1}$). Hence, difference scores are not computed prior to analysis, but a structural equation model is instead specified with strategically fixed parameters to model the difference as a latent variable (Wu et al., 2013). Difference scores have historically been used in psychology by calculating the absolute difference between a variable score at two time points. The difference score can then be used as an outcome variable regressed on various predictors. Difference scores have also been severely criticized for being unreliable (e.g., Cronbach & Fury, 1970), but more recent research has found that when sufficient individual differences in change over time exist, change scores can show reasonable levels of reliability (Rogosa, 1995). Unreliability is, however, dealt with when using LDS modeling because latent variable modeling accounts for measurement error (i.e., unreliability). Various parameters can be estimated using LDS modeling, such as dynamic change or proportional change, and the latent difference variable can be used as any other latent variable in SEM (Wu et al., 2013). The LDS model focuses on within-person change and between-person differences in change, and with two measurement points, the LDS can be viewed as a linear two-wave
LGCM. Hence, specifying an LDS model was deemed appropriate given that the aim of Study 1 was to examine longitudinal associations of within-person changes in a two-wave model.

**Study 2: Bayesian latent growth curve modeling**

In Study 2, we used LGCM (Bollen & Curran, 2006; Meredith & Tisak, 1990) to examine between-person differences in within-person change as well as within-person associations over time in a three-wave model. LGCM can be used to examine individuals’ growth trajectories as latent factors, and of the primary interest are the latent intercept and slope factors. The intercept and slope factors each have a mean and a variance, which represents different levels of analysis. The mean is a group-level parameter (i.e., fixed effect), and the variance corresponds to individual differences around the mean (i.e., random effect). The intercept mean often represents the initial status of the outcome variable, which is specified by the location of the zero in the specification of the slope factor (Little, 2013). The intercept, however, can be placed at any measurement point and should be placed on a meaningful occasion of measurement based on substantive meaning (Biesanz, Deeb-Sossa, Papadakis, Bollen, & Curran, 2004). The intercept variance represents individual differences around the group’s intercept mean. The slope mean is the average rate of change per unit of time in the outcome variable, and the slope variance represents individual differences in change around the group’s mean (i.e., heterogeneity in the growth trajectories; Stenling et al., 2016a). In the LGCM, it is possible to define different types of slope trajectories. The most straightforward are some of the polynomial functions: linear slope, quadratic slope (i.e., accelerating/decelerating change), and cubic slope (i.e., two bends in the growth curve). More complex functional forms are also possible, but introducing nonlinear functions makes the model substantially more difficult to estimate (Curran, Obeidat, & Losardo, 2010). The intercept and slope factors in the LGCM can be used as any other latent variable to predict or be predicted by other variables (Duncan & Duncan, 2004). Also, the time-specific indicators of the outcome variable, which is used to define the intercept and slope factors, can be predicted or predict other variables, for example, by including time-varying covariates in the model (Bollen & Curran, 2006).

Furthermore, instead of relying on the most commonly applied estimator, the maximum likelihood (ML) estimator (Marsh, 2007) within a frequentist framework, we choose to estimate the LGCM within a Bayesian framework (e.g., Stenling, Ivarsson, Johnson, & Lindwall, 2015). Frequentist and Bayesian statistics stem from different theories of probability, the frequentist paradigm and the subjective probability paradigm (van de Schoot et al., 2014). Hypothesis testing within a frequentist framework corresponds to the probability of the data given the model \( p(y \mid \theta) \). Hypothesis testing within a
Bayesian framework corresponds to the reversed question: What is the probability of the model given the data $p(\theta \mid y)$ (Kaplan & Depaoli, 2012)? This latter Bayesian interpretation is probably what most researchers often want to know, that is, what is the probability of the model or hypothesis given the data at hand (Stenling, Ivarsson, Johnson, & Lindwall, 2015)? Another difference between the frequentist framework and the Bayesian framework is the nature of unknown parameters in the model (Kaplan & Depaoli, 2012). When applying frequentist statistics, researchers assume that there is only one true population parameter that is fixed but unknown. Within Bayesian statistics, all unknown parameters incorporate uncertainty that can be defined by a probability distribution and an interval that captures this uncertainty that contains the parameter of interest (van de Schoot & Depaoli, 2014). Although not applied in our study, it is also possible with Bayesian estimation to incorporate previous knowledge about a parameter directly into the analyses. This previous knowledge is incorporated into the model estimation as a prior probability distribution of the parameters of interest, and researchers can specify a narrow or wide variance of the parameter depending on the level of (un)certainty about the parameter value of interest (Zyphur & Oswald, 2015). Hence, with Bayesian estimation, researchers can continuously update their knowledge and directly incorporate that new knowledge into their analyses instead of testing the same null hypothesis over and over again (van de Schoot et al., 2014). Furthermore, by including prior information, it is possible to estimate models that would be underidentified when employing ML estimation (Zyphur & Oswald, 2015) and to estimate new types of models, for example, by including cross-loadings and correlated residuals that can fix common problems associated with unrealistic model constraints (Muthén & Asparouhov, 2012). Bayesian estimation has better small-sample performance because asymptotic inferences are not required, and therefore, no normal approximations are required on the posterior. Because Bayesian estimation does not rely on numerical integration as ML estimation does, complex models that are computationally cumbersome or are impossible to estimate with ML can be estimated with Bayesian estimation (e.g., Muthén & Asparouhov, 2012; Scheines et al., 1999). In contrast to the frequentist confidence interval, the credibility intervals that can be generated for any parameter of interest indicate the probability (e.g., 95%) that the parameter of interest lies within the two values given the observed data (Stenling, Ivarsson, Johnson, & Lindwall, 2015).

**Study 3: Bifactor exploratory structural equation modeling**

Recently, Morin et al. (2015) proposed a bifactor exploratory structural equation modeling (ESEM) framework to identify distinct sources of construct-relevant psychometric multidimensionality. Given that the aim of
Study 3 was to examine multidimensionality in measures of coaches’ need-supportive and controlling behaviors, the recently proposed framework of Morin et al. (2015) provides a statistical model that corresponds well to the study aim. Multidimensional scales often correspond to a bifactor structure, that is, they consist of a general latent construct alongside several latent subdimensions that are more narrowly defined (Myers et al., 2014). Hence, both sources of construct-relevant variance need to be examined when evaluating multidimensional scales (Stenling, Ivarsson, Hassmén, & Lindwall, 2015). The bifactor measurement model has a long history, originating from the early work of Holzinger and Swineford (1937), but it has for a long time been overshadowed by Thurstone’s (1947) correlated-factor model, also known as the independent clusters model (ICM). The bifactor model, however, has been rediscovered in psychology (Reise, 2012), and it has also been extended into an ESEM framework (e.g., Jennrich & Bentler, 2011, 2012; Morin et al., 2015).

ESEM is a relatively recent development within the SEM literature, and applications of ESEM are increasing due to its ability to overcome some of the inherent problems with the ICM-CFA (e.g., Asparouhov & Muthén, 2009; Marsh, Morin, Parker, & Kaur, 2014). Indicators incorporate a part of random measurement error, but they also tend to have some degree of systematic association with other constructs, a problem referred to as the fallible nature of indicators (Morin et al., 2015). Such associations are constrained to be zero on the ICM-CFA but are dealt with by including cross-loadings in exploratory factor analysis. When not accounting for these systematic associations in multidimensional scales, factor correlations are extensively biased, and poor model fit is displayed (Asparouhov & Muthén, 2009; Marsh et al., 2014). It is very reasonable to assume that items are imperfect to some degree and have systematic associations with other constructs based on substantive theory or merely item content (Asparouhov & Muthén, 2009; Morin et al., 2015). By combining a bifactor measurement model with ESEM, researchers have the opportunity to investigate the co-existence of global and specific components within the same measurement model and account for the fallible nature of indicators (Morin et al., 2015). Several different rotations can be specified when estimating an ESEM model. In our study, we used target rotation (Asparouhov & Muthén, 2009; Browne, 2001), by which cross-loadings can be specified to be close to zero but not exactly zero. Hence, with target rotation, ESEM can be used for confirmatory purposes by specifying an a priori factor structure, freely estimating all target loadings, and specifying all non-target loadings close to zero (Asparouhov & Muthén, 2009).
The Empirical Studies

Study 1: Changes in Perceived Autonomy Support, Need Satisfaction, Motivation, and Well-Being in Young Elite Athletes

Background and aim
A four-stage motivational sequence outlined within SDT has been suggested to explain a process through which coaches’ interpersonal styles influence athletes’ need satisfaction, self-determined motivation, and well-being (e.g., Deci & Ryan, 2000; Mageau & Vallerand, 2003; Ng et al., 2012). Although support for this motivational process has been found in different domains, such as health care, work, and school settings (Deci & Ryan, 2008; Ng et al., 2012), few studies have longitudinally examined the entire motivational sequence. The few studies conducted in sport settings on the four-stage motivational sequence (Gagné et al., 2003; Isoard-Gauther et al., 2012) were limited with regard to sample diversity. They did not assess temporal order among the variables and did not examine within-person changes in all variables in the motivational sequence. The primary purpose of Study 1 was to address some of these limitations and to examine the associations of within-person changes in the four-stage motivational sequence (perceived coach autonomy support → need satisfaction → self-determined motivation → well-being) in a sample of young elite athletes. In addition, level-change associations between the study variables as well as reciprocal associations between the variables in the motivational sequence were examined. We hypothesized that changes in variables closer in the motivational sequence would be more strongly associated than those in variables further apart in the sequence and that the temporality proposed in the four-stage motivational sequence would be supported.

Method
Data were collected from a sample of 247 young elite skiers at two time points, in the beginning (T1) and at the end (T2) of the competitive season. The instruments are summarized in Table 1, and the primary statistical model employed was an LDS model (Figure 2; Selig & Preacher, 2009; Wu et al., 2013). As a secondary analysis we also examined reciprocal associations in a CLPM (Figure 3; Stenling et al., 2016a).
**Results and discussion**

With one exception, variables closer in the motivational sequence displayed stronger correlations compared to variables further apart. The exception was that change in perceived autonomy support was more strongly related to change in well-being than change in self-determined motivation. Few of the hypotheses for the level-change association (i.e., temporality proposed within SDT) were supported, and the results showed that higher levels of self-determined motivation at T1 positively predicted changes in perceived autonomy support and changes in well-being. Higher need satisfaction at T1 negatively predicted changes in perceived autonomy support, self-determined motivation, and well-being.

In the CLPM, higher self-determined motivation at T1 predicted higher need satisfaction and well-being at T2, whereas higher levels of well-being at T1 positively predicted perceived autonomy support at T2.

Taken together, these results indicate a complex and to some extent reciprocal or reversed pattern of associations between the variables in the four-stage motivational sequence over time. Reciprocal associations have been found in previous studies within the sport domain, for example, between motivation and burnout (Lonsdale & Hodge, 2011; Martinent, Decret, Guillet-Descas, & Isoard-Gautheur, 2014) and between need satisfaction and engagement (Curran et al., 2016). Recent research in the educational domain has also found reciprocal or reversed associations between students’ engagement and disengagement and perceptions of teachers’ autonomy support and control (Jang et al., 2012, 2016; Reeve,
These latter findings suggest that individual characteristics might be important determinants of people’s perceptions of others’ interpersonal behaviors. The results from Study 1 indicate that athletes with higher autonomous motivation and well-being might be more likely to seek out need supportive environments and might also be more receptive to the positive effects of coaches’ autonomy support.

Figure 3. Cross-lagged panel model. Only the structural part of the model is shown.

**Study 2: Longitudinal Associations Between Athletes’ Controlled Motivation, Ill-Being, and Perceptions of Controlling Coach Behaviors: A Bayesian Latent Growth Curve Approach**

**Background and aim**
Individual characteristics have been highlighted as important determinants of how athletes perceive coaches’ interpersonal styles (Deci & Ryan, 1987; Soenens et al., 2015; Stenling, Lindwall, & Hassmén, 2015). This is also supported by findings in the educational domain showing that students’ engagement and disengagement longitudinally predicted perceptions of teachers’ autonomy support and control (Jang et al., 2012, 2016; Reeve, 2013) and findings from work and organizational psychology showing similar results (Howell & Shamir, 2005). The findings in Study 1 showed that athletes’ self-determined motivation and well-being longitudinally predicted perceptions of coaches’ autonomy support. In Study 2, we explored whether similar associations were present when focusing on a maladaptive motivational process and examining the longitudinal associations between athletes’ controlled motivation, ill-being, and perceptions of coaches’
controlling behaviors. The primary purpose of Study 2 was to examine athletes’ controlled motivation and ill-being as predictors of their perceptions of coaches’ controlling behaviors, at the between- and within-person levels. A secondary purpose was to examine changes in the perceptions of coaches’ controlling behaviors as a predictor of athletes’ controlled motivation and ill-being, as well as reciprocal associations between athletes’ controlled motivation and ill-being over time.

**Method**
The same sample as in Study 1 was used in Study 2, with the exception that we included data from all three time points: the beginning of the competitive season (T1), midseason (T2), and the end of the season (T3). We used Bayesian LGCM (e.g., Song & Lee, 2012; Zhang, Hamagami, Wang, Nesselroade, & Grimm, 2007) with two different specifications. In the first model (Figure 4), we focused on the between-person level and examined athletes’ controlled motivation and ill-being as predictors of the slope factor of coaches’ controlling behaviors. Furthermore, the intercept and slope factors of coaches’ controlling behaviors predicted athletes’ controlled motivation and ill-being at T3, and reciprocal associations were estimated between athletes’ controlled motivation and ill-being at T1 and T3. In the second LGCM (Figure 5), we estimated effects at the within-person level and examined athletes’ controlled motivation as predictors of their perceptions of coaches’ controlling behaviors.

**Results and discussion**
In the first model, athletes’ controlled motivation and ill-being were not credible predictors of the slope factor (i.e., change) of coaches’ controlling behaviors over the competitive season. The slope factor of coaches’ controlling behaviors was a credible predictor of athletes’ controlled motivation at T3, but it was not a credible predictor of athletes’ ill-being at T3. Athletes’ controlled motivation at T1 was a credible predictor of ill-being at T3 but not vice versa. In the second LGCM, athletes’ controlled motivation was a positive and credible predictor of athletes’ perceptions of coaches’ controlling behaviors at the within-person level. The results from the conditional LGCM at the between-person level were in line with the tenets and the temporal order proposed within the SDT process model (e.g., Ng et al., 2012; social-contextual factors → the basic psychological needs → motivation → health). The associations between athletes’ controlled motivation and ill-being are in line with previous studies (Lonsdale & Hodge, 2011) with similar study designs regarding the sample, spacing between measurement points, and instrument for assessing motivation.
Figure 4. Conditional latent growth curve model. CB = controlling coach behaviors, CM = controlled motivation, IB = ill-being, I = intercept, S = slope. The covariance between the intercept and slope factors was set to zero in the conditional latent growth curve model.

Figure 5. Unconditional latent growth curve model with time-varying covariates. CB = controlling coach behaviors, CM = controlled motivation, IB = ill-being, I = intercept, S = slope.
However, they differ from previous studies that involved younger athletes, had shorter intervals between measurements, and used other instruments for assessing motivation (Martinent et al., 2014). These results suggest that these design issues are important to consider when examining reciprocal associations between athletes’ motivation and ill- and well-being. The within-person results indicate that individual characteristics, such as motivation and ill-being, predict social perceptions to the extent that they are attributed to the social stimuli. Controlled motivation was a positive predictor of coach perception, which might be due to the contextual similarity of the measures, whereas athletes might not attribute their general ill-being to the coach (Hall & Lord, 1995). The results are in line with suggestions that individual characteristics make people more or less sensitive to environmental stimuli (Deci & Ryan, 1987; De Meyer et al., 2016; Hall & Lord, 1995; Moller et al., 2010; Soenens et al., 2015) and might indicate that athletes with higher controlled motivation are more likely to notice controlling coach behaviors because it matches their motivational profile.

**Study 3: Using Bifactor Exploratory Structural Equation Modeling to Examine Global and Specific Factors in Measures of Sports Coaches’ Interpersonal Styles**

**Background and aim**
In line with most previous research in sports, coaches’ autonomy-supportive and controlling interpersonal styles were in Study 1 and Study 2 conceptualized as unidimensional constructs (Ntoumanis, 2012). Several scholars (Ntoumanis, 2012; Pope & Wilson, 2012; Standage, 2012), however, have highlighted that more attention should be given to the multidimensional conceptualizations of these interpersonal styles. In addition to autonomy support, coaches’ provision of structure and involvement are also important determinants of athletes’ need satisfaction, motivation, and well-being (Mageau & Vallerand, 2003). Coaches’ controlling behaviors also consist of several subdomains, controlling use of rewards, negative conditional regard, intimidation, and excessive personal control (Bartholomew et al., 2009, 2010). Both of these constructs (need-supportive and controlling coach behaviors) contain a general construct and several specific subdimensions; hence, they correspond to a bifactor structure (Holzinger & Swineford, 1937; Reise, 2012). The purpose of Study 3 was to examine distinct sources of construct-relevant psychometric multidimensionality in two sport-specific measures of coaches’ need-supportive and controlling interpersonal styles.
Method
Study 3 consists of two studies: 3a and 3b. The sample in Study 3a was 277 young male and female floorball players who responded to the ISS-C (Wilson et al., 2009). The sample in Study 3b was 233 young male ice-hockey players who responded to the CCBS (Bartholomew et al., 2010). Data were analyzed following the framework proposed by Morin et al. (2015). In the first step, we compared ICM-CFA with ESEM models, and then we estimated bifactor ESEM models to examine two sources of psychometric multidimensionality in the ISS-C and CCBS. The models are graphically depicted in Figure 6a–6c.

Results and discussion
For both instruments, the ESEM model provided a better fit to the data compared to the ICM-CFA, indicating that items had systematic associations with non-target constructs that needed to be accounted for in the analyses. The ISS-C did not display a bifactor pattern. All items had statistically significant loadings onto the general factor, and most items had low and not statistically significant loadings onto their specific subdimensions. Two of the four subdimensions (negative conditional regard and excessive personal control) of the CCBS displayed a bifactor pattern with relatively strong factor loadings on both the general and specific factors. Hence, these two factors seem to consist of two sources of construct-relevant psychometric multidimensionality (Morin et al., 2015). The controlling-use-of-rewards factor displayed weak loadings on the general factor and strong loadings on the specific factor. These results indicate that it might represent a slightly different aspect of controlling coach behaviors compared to the other three dimensions that appear to have a common core. Finally, the intimidation factor displayed weak loadings onto the specific factor and strong loadings onto the general factor, which shows that this factor is mostly explained by the general factor. These results suggest that the ISS-C in its present form is a unidimensional scale rather than a multidimensional scale. A lack of multidimensionality is a common observation when applying assumed-to-be multidimensional self-report instruments of leadership, such as perceptions of transformational leadership (e.g., van Knippenberg & Sitkin, 2013). It is important that measures can discriminate between different subdimensions; collecting other types of data could be useful for that purpose. The differential patterns displayed for the CCBS subdimensions cause one to question the multidimensional nature of this instrument in its present form. Future research should replicate these findings and more closely examine the antecedents and consequences of the specific subdimensions to enhance our knowledge of the nature of controlling coach behaviors.
Figure 6a-6c. Independent clusters model confirmatory factor analysis (top left), exploratory structural equation model (top right), and bifactor exploratory structural equation model (bottom left).
General Discussion
The primary aim of this thesis was to explore and increase our knowledge of the leadership process in sports from an SDT perspective. Specifically, I examined how coaches’ autonomy-supportive and controlling interpersonal styles longitudinally are associated with young athletes’ motivation and ill- and well-being. The psychometric multidimensionality in the self-report measures of athletes’ perceptions of need-supportive and controlling coach behaviors was also investigated. The discussion will initially be organized according to these two broad themes: (I) longitudinal associations and temporal ordering (reciprocal or reversed associations) of coaches’ interpersonal styles, athletes’ motivation, and ill- and well-being (Study 1 and Study 2); and (II) the multidimensional nature of measures of coaches’ interpersonal styles (Study 3). Following the discussion of the findings related to these themes, the main limitations of the studies will be discussed, followed by a discussion of challenges associated with an autonomy- or need-supportive interpersonal style. Finally, implications and suggestions for future research and some final remarks are provided.

Coaches’ Interpersonal Styles and Athletes’ Motivation and Ill- and Well-being
The focus of Study 1 and Study 2 were longitudinal associations between athletes’ perceptions of coaches’ autonomy-supportive and controlling interpersonal styles, motivation, and ill- and well-being. Using the SDT-based motivational sequence as a starting point (i.e., social factors → psychological mediators → types of motivation → consequences), previous research was extended by focusing on within-person change processes and further exploring the temporal ordering of the variables in the sequence. The initial hypothesis was that temporal ordering in the motivational sequence would be supported, a hypothesis only partially supported by the empirical data. In Study 1, it was observed that within-person changes in perceived autonomy support, need satisfaction, self-determined motivation, and well-being were all positively correlated, a result in line with the tenets of SDT (Deci & Ryan, 2000) and previous research (e.g., Gagné et al., 2003). Results also in line with SDT and previous research were that self-determined motivation over time positively predicted level and change in well-being (Study 1), that changes in the perceptions of coaches’ controlling behaviors positively predicted late-season controlled motivation, and that controlled motivation early in the season positively predicted late-season ill-being (Study 2). These latter results follow the theoretical propositions within SDT (Deci & Ryan, 1985, 2000, 2014) and previous empirical findings (Lonsdale & Hodge, 2011; Ng et al., 2012; Pelletier et al., 2001). The results indicate that when athletes’ experience that their coach is more autonomy supportive,
they also experience higher degrees of need satisfaction, autonomous motivation, and well-being compared to other athletes' experiencing their coach as less autonomy supportive. Conversely, athletes' experiencing their coach as more controlling also seem to experience more controlled motivation and ill-being compared to athletes' experiencing their coach as less controlling. Hence, the adaptive and maladaptive process models proposed within SDT were (at least partially) supported in Study 1 and Study 2.

Several paths in Study 1 and Study 2 also suggested reciprocal or reversed associations among the variables in the motivational sequence. Most SDT-based research has followed a unidirectional temporal order of the motivational sequence and has examined associations between coaches’ autonomy-supportive and controlling interpersonal styles and athlete outcomes (Ntoumanis, 2012; Occhino et al., 2014). Little attention has been given to potential reciprocal or reversed associations despite several scholars’ acknowledging them as salient for understanding motivational processes (Deci & Ryan, 1987; Ntoumanis, 2012; Occhino et al., 2014; Reeve, 2015; Skinner & Belmont, 1993; Smoll & Smith, 1989). The results from Study 1 showed that higher self-determined motivation early in the season predicted higher levels of need satisfaction late in the season. Higher self-determined motivation early in the season also predicted within-person changes in perceived autonomy support from the coach. Higher well-being early in the season was a positive predictor of perceived autonomy support from the coach at the end of the season. Furthermore, the results from Study 2 indicated that controlled motivation, but not ill-being, positively predicted perceptions of coaches’ controlling behaviors at the within-person level. The fact that well-being but not ill-being predicted athletes’ perceptions of coaches’ interpersonal styles might indicate that the athletes attribute their well-being to factors associated with the coach, whereas they might not attribute their ill-being to the coach (cf. Hall & Lord, 1995). This explanation is, however, highly speculative, and more research is needed on this topic.

Individual factors, such as motivation and well-being, appear to function as important determinants of how athletes perceive coaches’ interpersonal styles. The importance of individual factors as influential for interpersonal perceptions have been acknowledged in the SDT literature (e.g., Deci & Ryan, 1987; De Meyer et al., 2016; Reeve, 2015; Soenens et al., 2015), is included in the mediational model of leadership (Smoll & Smith, 1989, 2002), and has been highlighted in the organizational leadership literature (Avolio, 2007; Hall & Lord, 1995; Howell & Shamir, 2005; Shamir et al., 1993). The results suggest that athletes’ motivation is associated with how they perceive their coach’s interpersonal styles at the within-person level, in line with the propositions of interpersonal synchrony (Jang et al., 2012; Reeve, 2013, 2015), the sensitization-desensitization process (De Meyer et
al., 2016; Moller et al., 2010), and motives as cognitive influences of leadership perceptions at the person level (Hall & Lord, 1995). These reversed associations have been observed in the educational domain (Jang et al., 2012, 2016), and our results suggest that similar processes might occur in the sport domain.

The next step is to understand the underlying mechanisms through which these processes occur, which is an important issue to address in future research. Several potential explanations for understanding this reciprocal or reversed process have been put forward in the literature, and here, I provide three plausible explanations that can guide future research. The first explanation is related to athletes' perceptions and how individual characteristics influence perceptions of others' interpersonal styles. Several scholars (Deci & Ryan, 1987; De Meyer et al., 2016; Hall & Lord, 1995; Moller et al., 2010; Soenens et al., 2015) have proposed that individual characteristics make people more or less sensitive to environmental stimuli. Thus, athletes with higher levels of autonomous or controlled motivation are more likely to notice autonomy-supportive or controlling coach behaviors, respectively, because such behaviors match their motivational profiles. This reasoning is also supported by neuroscience research showing that adolescents have an increased sensitivity to both positive and negative environmental and motivational cues, such as heightened amygdala responses to emotional facial expressions and increased ventral striatal responses in incentive-related decision-tasks (Somerville & Casey, 2010; Somerville, Jones, & Casey, 2010). These results can therefore be explained as an intraindividual process occurring within athletes, making them more or less prone to certain environmental and motivational cues that their coach provides, such as body language, rewards, tone of voice, and type of feedback.

A second explanation is that individual characteristics affect athletes' behaviors that, in turn, will influence coaches' behaviors. Reeve (2015) proposed that students' agentic engagement can orient teachers to provide students with a more autonomy-supportive interpersonal style and that students' disengagement can orient teachers toward a more controlling interpersonal style. This reasoning would suggest that athletes' motivation will influence athletes' behaviors that, in turn, will influence coaches' behaviors to be more in synchrony with the athletes' behaviors. Thus, these results could be viewed as an interindividual process between athletes and coaches.

A third explanation is that coaches' individual characteristics, expectations, and perceptions of athletes will influence their behaviors. Research in the educational domain indicates that teachers interacted in a more controlling way when students were perceived as less motivated (Sarrazin et al., 2006). Research also shows that teachers believe that
students with high autonomous motivation would benefit most from an autonomy-supportive interpersonal style, whereas students with high controlled motivation would benefit most from a controlling interpersonal style (De Meyer et al., 2016). This suggests that how coaches perceive athletes’ behaviors, motivation, and other characteristics (e.g., engagement), and what they expect of their athletes will influence how they behave towards them. This latter explanation is also in line with Mageau and Vallerand’s (2003) motivational model of the coach–athlete relationship, suggesting that coaches’ perceptions of athletes’ motivation and behaviors will influence their interpersonal styles. Hence, the results can be explained as an intrapersonal process within coaches.

All three explanations are viable alone or in combination. They are also possible to test with various study designs and would lend themselves particularly well to experimental designs or intensive longitudinal designs (e.g., diary studies) focusing on dyadic associations. Future research examining these three explanations in sport settings would enhance our knowledge of the dynamics of the coach–athlete relationship.

The Multidimensional Nature of Measures of Coaches’ Interpersonal Styles
SDT-based research in sports has mainly focused on autonomy support versus control from a unidimensional perspective (Ntoumanis, 2012; Stenling, Ivarsson, Hassmén, & Lindwall, 2015). Recently, however, scholars (e.g., Mageau & Vallerand, 2003; Ntoumanis, 2012; Standage, 2012; Stenling, Ivarsson, Hassmén, & Lindwall, 2015) have suggested that more attention should be given to the multidimensional nature of need-supportive and controlling interpersonal styles. Despite being somewhat neglected in the sport psychology literature, the notion of several interacting interpersonal styles is not new in the SDT literature. Deci and Ryan (1985) and others (Connel & Wellborn, 1991; Grolnick & Ryan, 1989) argued that structure and involvement are also essential motivational styles that function as important determinants of people’s perceptions of competence and relatedness. These interpersonal styles have been the focus of much research, for example, in the educational domain (e.g., Jang et al., 2010; Reeve & Su, 2014; Skinner & Belmont, 1993) and in research on parenting (e.g., Grolnick, 2003; Joussemet, Landry, & Koestner, 2008), but the impact of these various interpersonal styles in the sport domain is scarce.

It is argued that the need-supportive interpersonal styles—autonomy support, structure, and involvement—are highly interrelated (e.g., Markland & Tobin, 2010; Ryan, 1991), and they are therefore often combined into a higher-order construct labeled “need support.” The results from Study 3a were in line with such reasoning as indicated by the strong factor correlations between the subdimensions and the strong factor loadings onto
the general need-support factor. Strong correlations between the subdimensions are common in the SDT literature (Niemiec et al., 2006; Wilson et al., 2009), and we have observed similar patterns in the work domain for measures of managers’ need support (Tafvelin & Stenling, 2016) and in the educational domain for measures of physical education teachers’ need support (Sánchez-Oliva, Kinnafick, Smith, Stenling, & García-Calvo, 2016). Similar patterns can also be found in the general leadership literature, where subdimensions on multidimensional scales are often highly interrelated (e.g., in transformational leadership research; Beauchamp et al., 2010; van Knippenberg & Sitkin, 2013). Strong interrelationships between need-support dimensions might indicate that coaches who are need supportive with regard to one dimension (e.g., autonomy support) are also need supportive with regard to other dimensions. This complementary hypothesis is supported by research in the educational domain showing that teachers’ autonomy support and structure are positively correlated ($r = .60$; Jang et al., 2010), as well as observational research of soccer coaches indicating positive associations among autonomy support, the provision of structure, and involvement ($r$s ranged from .59 to .68; Smith, Quested, Appleton, & Duda, 2016).

Another explanation is related to the use of self-report measures, such as questionnaires for measuring perceived leadership. The respondents may not be able to distinguish between items intended to capture these various dimensions of need support. In general, there is an overreliance on self-report measures in the SDT-based sport psychology literature, and complementary operationalizations of need-supportive coaching (as well as basic psychological needs and motivation) are warranted. Nearly 40 years ago, Campbell (1977) argued that:

*We are in very grave danger of transforming the study of leadership to a study of self-report questionnaire behavior, if, indeed, the transformation has not already occurred. The method is too quick, too cheap, and too easy, and there are now many such questionnaires that possess no construct validity whatsoever. I submit that when both the independent and dependent variables are based on self-reports by the same person, we have learned absolutely nothing about leadership, no matter what the results turn out to be.* (p. 229)

If researchers are to rely on the self-report instruments of leadership perceptions, potential problems related to common-method bias, such as response-order effects (e.g., Chan et al., 2015), should *a priori* be addressed by the research design. Several recommendations for remedying common-method bias have been provided, such as collecting data on the independent
and dependent variables from different sources; temporal, proximal, or psychological separation between independent and dependent variables; eliminating common scale properties; and reducing item ambiguity and social desirability (Podsakoff et al., 2012). The systematic use of these recommendations and increased transparency in the reporting of the steps that researchers take to remedy common-method bias would strengthen the conclusions drawn and increase the possibility for other researchers to determine the potential impact of common-method bias in research studies. An increased transparency is strongly encouraged in future research.

The ability to empirically distinguish multidimensional constructs is important, as it would allow researchers to explore whether these leadership dimensions truly are additive (i.e., the more the better), which is assumed when sum scores of need support are used, or if their relationships have other forms (cf. van Knippenberg & Sitkin, 2013). For example, rather than assuming an additive effect, it may be a matter of specifying a minimum value on each of these dimensions that determines when someone can be characterized as need supportive. Another argument could be that the need-support dimensions are interactive, and engaging in one type of need support would make the other types more effective (i.e., moderating effects). Structure and involvement are often presented as “what” a person does, whereas autonomy support refers to “how” the person does it (Deci & Ryan, 2000; Grolnick, 2003; Joussemet et al., 2008), which implies that there should be interactive effects, such that structure and involvement will be effective when provided in an autonomy-supportive way. This line of thought has to some extent been supported in educational research, where Jang et al. (2010) found that autonomy support and structure appear to be two complementary engagement-fostering interpersonal styles among teachers associated with students’ classroom engagement. A third argument could be that one need-support dimension can compensate for the lack of another (van Knippenberg & Sitkin, 2013). Most evidence so far suggests that the three need-support dimensions are interactive, in that structure and involvement will be enhanced when provided in an autonomy-supportive way (Reeve & Su, 2014). However, research on these various hypotheses is lacking in the sport psychology literature. Furthermore, to investigate these hypotheses, it is imperative that the three need-support dimensions are empirically distinguishable, regardless of how they are operationalized. This is an important avenue for future research on the assessment of coaches’ need support.

The results from Study 3b call into question that the CCBS consists of a coherent multidimensional structure. Three of the subdimensions displayed relatively coherent factor-loading patterns onto the general factor, indicating that they share a common core, whereas the subdimension of controlling use of rewards did not. The controlling-use-of-rewards subdimension is
theoretically grounded in the undermining effect, which explains how and when rewards undermine people’s intrinsic motivation (Deci et al., 1999). The undermining effect have been found salient when tangible rewards are provided as incentives for engaging in and completing a task (i.e., task-contingent reward) or are given for reaching certain performance standards (i.e., performance-contingent rewards), particularly when the reward is expected. The undermining effect of rewards on intrinsic motivation has also been found in sports contexts (e.g., Vansteenkiste & Deci, 2003). Most of the undermining-effect studies, however, have been conducted at the situational level in experimental settings where variables, such as different types of rewards, are easy to manipulate. It is possible that the questions in the CCBS do not capture an undermining effect because they are measured at the contextual level, and due to the way in which they are formulated. It might also be argued that the controlling-use-of-reward items are not necessarily perceived as controlling by the respondents, depending on, for example, individual difference factors, such as motivational profile, need satisfaction, and personality. Also, depending on the context under study, it might be that the other three subdimensions (negative conditional regard, intimidation, and excessive personal control) are more frequently occurring and share a common core because they all represent a clearer set of behaviors compared to the subdimension of controlling use of rewards. All in all, the items do not necessarily in their current form capture the known prerequisites for an undermining effect (e.g., tangible rewards, known rewards), which might explain the weak associations with the general factor.

**Limitations**
The empirical studies herein contain several limitations. The specific limitations of each study can be found in the papers. Here, I will summarize some of the main limitations of the three studies. First, all three studies relied on data collected via self-report questionnaires. Hence, the knowledge generated in the present thesis refers to athletes’ perceptions of coaches’ interpersonal styles, as well as athletes’ self-reported need satisfaction, motivation, and ill- and well-being. Relying on a single source of data increases the risk for method bias (Podsakoff et al., 2012), and questionnaire-generated data have been critiqued for often being arbitrary metrics (Andersen, McCullagh, & Wilson, 2007; Baumeister, Vohs, & Funder, 2007; Ivarsson et al., 2015). Common method bias is a well-established phenomenon; one common observation is that associations between variables from the same source (e.g., self-report questionnaires) are stronger compared to associations based on data from different sources, and these associations are inflated due to common method bias (Podsakoff et al., 2012). The sources of the bias can be related to various factors, such as the effects of response style, item wording, proximity and reversed items, item
context, and person factors, such as mood and interpersonal context. The longitudinal design in Study 1 and Study 2, as well as the use of latent variable modeling, which accounts for measurement error, are remedies against method bias, at least to some extent, but method bias is still an issue in this type of study.

Andersen et al. (2007) stated that:

Sport and exercise psychology researchers use numbers extensively. Some of those numbers are directly related to overt real-world behaviors such as how high an athlete jumps or how far some object is thrown. Many of those measures, however, do not have such intimate connections to real-world performance or behavior. They often involve self-reports on inventories or surveys that are measuring (or attempting to measure) some psychological, underlying, or latent variables such as task and ego orientation or competitive state anxiety. What those scores on self-report inventories mean may be somewhat of a mystery if they are not related back to overt behaviors. (p. 664)

Given that all of the studies relied on self-report measures (i.e., arbitrary metrics), the results and implications of the results are not easily interpreted in terms of real-world meaning. We did not assess coaches’ behaviors directly (e.g., observed the coaches’ behaviors), we did not assess the behavioral consequences of athletes’ motivation or ill- or well-being, and we did not include data from other sources, such as physiological measures of health (e.g., cortisol), which all would have been viable options for the measures used in the three studies. Although the study designs we have used are common in the sport psychology literature, the need for progression exists with regard to operationalization and study designs to avoid common-method bias and arbitrary metrics that make the translation into real-world meaning difficult (Arthur & Tomsett, 2015; Ivarsson et al., 2015).

Second, all three studies focused on the contextual level, which refers to athletes’ general experiences in relation to their sport participation. Assessing at this level has some downsides, such as which timeframe the reported experience captures, the athletes’ capacity to actually summarize and provide an average experience, and the decontextualization of the motivational process under study. All of the variables assessed in these studies (coaches’ interpersonal styles, athletes’ need satisfaction, motivation, and ill- and well-being) fluctuate and change over time, often over very short periods of time (e.g., hours, days). The dynamic nature of these constructs makes them highly suitable for study designs that can capture dynamic processes in specific situational contexts (Gagné & Blanchard, 2007; Ryan,
Diary studies have shown that daily variation in, for example, need satisfaction is related to daily variation in well-being (e.g., Reis, Sheldon, Gable, Roscoe, & Ryan, 2000), findings that have been replicated in sports settings (e.g., Bartholomew et al., 2011; Gagné et al., 2003). Studies situated in specific contexts would also make it easier to assess the real-world implications of changes in these motivational variables.

Third, Study 1 and Study 2 relied on longitudinal data, which allowed us to examine temporal associations among the study variables. Although we followed a common measurement scheme in the sport psychology literature—early in the season, middle of the season, and end of the season—it might not accurately reflect the change process we are trying to capture (Collins, 2006; Ployhart & Vandenberg, 2010). Furthermore, three measurement points limit the possibility of modeling different shapes of the growth trajectory, such as quadratic or cubic, which would have required four or five measurement points, respectively (Bollen & Curran, 2006). Although several longitudinal studies have focused on the SDT-based motivational sequence, a theory of time has yet to be incorporated into SDT (see Wasserkampf & Kleinert, 2016, for one of the few papers on change and time in SDT-based research). George and Jones (2000) provided a useful framework for the role of time in theory and theory building that could aid the incorporation of time into SDT. They provided six time dimensions: (a) past, future, and present and subjective experience of time; (b) time aggregations; (c) durations of steady states and rates of change; (d) incremental versus discontinuous change; (e) frequency, rhythm, and cycles; and (f) spirals and intensity. Researchers can use these to theorize about the change process under study. George and Jones (2000) further proposed that these six time dimensions should be combined with the “what” (referring to a single construct), “how” (referring to relationships among two or more constructs), and “why” (referring to the underlying mechanisms) of theory for a more complete understanding of processes over time. Integrating this framework into SDT-based research would be useful for gaining a better understanding of the dynamic nature of motivational processes.

Fourth, a common saying in statistics is that correlation does not imply causation (Shadish et al., 2002), a saying also true for the work presented in the present thesis. The data presented in all three studies are correlational in nature, meaning that the conclusions drawn refer to associations and not causal effects. Three necessary criteria often specified for causation are that: (a) the cause preceded the effect, (b) the cause was related to the effect, and (c) there was no other plausible alternative explanation for the effect other than the cause (Shadish et al., 2002; see also Hill, 1965). The main problems in observational studies are related to the first and last criteria, that is, to untangle the temporal order and to rule out alternative explanations. As reported in the introduction, there have been very few SDT-based
intervention studies in sport settings using designs that allow researchers to draw causal inferences (see Langan et al., 2013). Although experimental designs, such as randomized controlled trials, often are the design of choice for causal inferences, methods for inferring causality in observational studies exist, but these methods are not widely known in the social sciences (Antonakis, Bendahan, Jacquart, & Lalive, 2014). Experimental designs and randomization may in many cases not be applicable in field-based research; therefore, researchers need to apply other methods to be able to infer causality (Antonakis, Bendahan, Jacquart, & Lalive, 2010). A problem in non-experimental designs is endogeneity—which includes omitted variables, omitted selection, simultaneity, common-method variance, and measurement error—which can make estimates causally uninterpretable. Increased attention in observational and non-experimental studies to appropriate design conditions and statistical methods (e.g., propensity score analysis, instrumental variables, regression discontinuity, and difference-in-difference models) under which causal inferences can be drawn would be a useful contribution to the SDT literature.

Challenges of an Autonomy- or Need-Supportive Interpersonal Style
Plenty of evidence suggests that an autonomy-supportive interpersonal style is associated with positive outcomes and a controlling interpersonal style is associated with negative outcomes (Ntoumanis, 2012). Becoming an autonomy-supportive coach, however, is not easy, and the related hurdles and challenges require attention from both practitioners and researchers to help coaches translate theory into practice (Ntoumanis & Mallett, 2014; Occhino et al., 2014). Based on research in the educational domain, Reeve (2009) proposed seven reasons for why teachers adopt a controlling interpersonal style, which were classified into three broader categories: (a) pressure from above; (b) pressure from below; and (c) pressure from within. Although research on these factors in the sport domain is scarce, research from other domains are useful for understanding why autonomy-supportive coaching might be challenging. Pressure from above refers to interpersonal-power differences in relationships and that coaches (who are in a one-up position) have an inherent powerful social role, which may steer them toward controlling behaviors. Potentially coaches’ take on double burdens: accountability due to job conditions and responsibility for athletes’ behaviors and outcomes, which can pressure them to become more controlling. Being controlling can be culturally valued, and controlling instructional strategies can be seen as an indicator of competence. Hence, social and cultural expectations of what it means to be a coach can increase controlling behaviors. Coaches sometimes equate control with structure and autonomy support with a chaotic or laissez-faire interpersonal style. A structured
environment versus a chaotic environment is one aspect of coaches’ interpersonal styles, whereas autonomy support versus control is another, separate aspect of coaches’ interpersonal styles. However, differentiating aspects of coaches’ interpersonal styles in such a way may not be obvious for coaches. Pressure from below refers to the people in a one-down position, in this case, the athletes and how their behaviors and motivation influence coaches’ interpersonal styles. For example, when athletes’ express disruptive behaviors or are perceived as less motivated or extrinsically motivated, coaches are likely to adopt a more controlling interpersonal style (Sarrazin et al., 2006; Skinner & Belmont, 1993). Finally, pressure from within refers to control-oriented personal dispositions. Coaches who themselves coach for nonautonomous reasons are more likely to interact with and try to motivate athletes in a controlling way (Occhino et al., 2014). This latter point is further supported by meta-analytic evidence showing that trainees who were more autonomy oriented were more likely to benefit from autonomy-supportive training programs compared to trainees with a control orientation (Su & Reeve, 2011).

Ntoumanis and Mallett (2014) and Occhino et al. (2014) further elaborated on the challenges of an autonomy-supportive pedagogical approach and translating theory into practice. A shift from a more controlling to a more autonomy-supportive interpersonal style can be challenging for many coaches, and research on the challenges and barriers of translating SDT theory into practice is scarce (Ntoumanis & Mallett, 2014). In the motivational model of the coach–athlete relationship (Mageau & Vallerand, 2003), three broad factors are specified as antecedents to coaches’ interpersonal styles: coaches’ personal orientations, the coaching context, and coaches’ perceptions of athletes’ behaviors and motivation. These three factors correspond well to the categorization of influencing factors as pressure from within, pressure from above, and pressure from below (Reeve, 2009). Occhino et al. (2014) highlighted the limited evidence of the challenges of translating theory into practice, the limited understanding of the individual and the interaction effects of coaches’ personal orientations and the coaching context, and athletes’ perceptions of quality coaching as additional factors that might hinder the translation from theory to practice. Furthermore, teachers become more autonomy supportive after they believe it is easy to do (referred to as easy-to-implement beliefs; Reeve & Cheon, 2016). Hence, future interventions could be structured to better support changes in the participants’ easy-to-implement beliefs, which can aid the shift toward becoming more autonomy supportive.

In a recent autonomy-supportive intervention, coaches were interviewed after the intervention about their experiences with the intervention program and the potential barriers to adopting an autonomy-supportive coaching style (Mahoney et al., 2016). The identified barriers were restrictions on time
and dissonance between the workshop content and performance context (the coaching context), relapse into previous coaching behaviors (coaches’ personal orientations), and limited understanding of the workshop materials, which can be referred to as a training-design factor. These barriers highlight the importance of contextualizing interventions to fit the needs of the participants. Instead of a top-down approach, researchers can apply a bottom-up approach and involve the participants already in the design phase of the intervention to develop an intervention that matches the needs of the participants and also to understand the context in which the participants operate, as well as potential barriers and challenges within that context. Useful frameworks in the organizational literature, such as the dynamic integrated evaluation model (DIEM; Schwarz, Lundmark, & Hasson, 2016), are available for researchers in sport psychology to adopt, as they detail the steps necessary for contextualizing, implementing, and evaluating interventions. Although mostly applied in organizational interventions, frameworks such as the DIEM provide researchers with tools for contextualizing, implementing, and evaluating interventions in a way that captures the dynamic change processes occurring during the different phases of an intervention, instead of relying on traditional pretest-posttest designs. An integration of SDT with frameworks, such as the DIEM, when designing, implementing, and evaluating interventions have the potential to increase our knowledge of and overcome some barriers and challenges with translating SDT theory into practice.

Implications for Research
I set out to explore the leadership process in sports from an SDT perspective, and the results have generated knowledge about temporal order (reciprocal or reversed associations) and multidimensionality—two theoretical problems in need of further inquiry. Going back to the underlying philosophy of science guiding this work—pragmatism—with an ends-in-view approach, one might wonder what practical knowledge has thus been gained? Guided by abductive inference, also known as “inference to the best explanation” (Marcio, 2001, p. 103), our interpretation of the results provides some implications for research with regard to the leadership process and the dynamic coach–athlete relationship, which also leads to opportunities for future research. These results and their implications, however, should be taken as provisional and functional, not as fixed and given (Dewey, 1938).

The first implication relates to the findings in Study 1 and Study 2, referred to as reversed associations. Several scholars have acknowledged the importance of individual factors’ influence on people’s perceptions of contextual factors (Deci & Ryan, 1987; Soenens et al., 2015; Weinstein & Ryan, 2011). Deci and Ryan (1987) stated that:
However, dispositional or person factors are also relevant to the study of autonomy and control. There are evident individual differences in the functional significance people give to contextual factors. (p. 1025)

Soenens et al. (2015) similarly argued that:

Parents’ actual behaviors are distinct from children’s appraisal of these behaviors, which involves perceiving and attributing meaning to parents’ behavior. Although parents’ actual behavior is associated with the way the behavior is appraised, this link is not perfect; that is, different children perceive and interpret the same parental behavior differently, and these differential appraisals may be shaped by the factors highlighted in relativistic accounts of parenting. (pp. 45–46)

It appears that athletes’ general well-being and autonomous and controlled motivation may function as determinants of their sensitivity to coaches’ autonomy support and control. In the present thesis, three plausible mechanisms are proposed that can explain these reversed associations: (a) an intraindividual process within athletes; (b) an interindividual process between athletes and coaches; and (c) and intraindividual process within coaches. These potential mechanisms provide opportunities for future research to further untangle these reversed associations.

A second implication stems from the findings in Study 3a and Study 3b about the multidimensional nature of measures of coaches’ interpersonal styles and the potential mismatch between theories about coaches’ interpersonal styles and how they are operationalized. The theoretical notion of various interrelated but distinct subdimensions of interpersonal styles (Ryan, 1991) renders itself to empirical testing using various operationalizations. If researchers are to adequately address the theoretical notion of distinct subdimensions, it is important to be able to tease out whether these high interrelations reflect a measurement bias or reflect that coaches exhibiting high levels of one subdimension (e.g., structure) also exhibit high levels of another subdimension (e.g., autonomy support). The bifactor ESEM framework (Morin et al., 2015) allows researchers to match the theory behind the measurement instrument with the model imposed on the data when evaluating multidimensional constructs (Myers et al., 2014). In both studies, the results indicated a mismatch between the theory behind the measurement instrument and what the instrument captures. Finding measures and statistical models that match the assumptions in the theory is a crucial step when designing studies. When such a match exists, researchers can adequately test the propositions specified within a theory. Hence, the
continued refinement of measures of coaches’ interpersonal styles is warranted in future research.

From a methodological standpoint, the statistical analyses used are also viewed as a contribution, as they provide examples of useful but underutilized statistical tools that correspond well too many of the research questions of interest for sport psychology researchers. Longitudinal studies in sport psychology have mainly been analyzed with traditional analyses, such as ANOVAs, regression, or SEM, such as CLPM, which are analyses capturing associations at the between-person level (Stenling et al., 2016a; 2016b). The between-person level refers to one person’s level compared to another person’s level. Within-person analyses, on the other hand, refer to whether the association for one person is higher or lower compared to the expected association for that particular person. The type of analyses used in Study 1 and Study 2 can be used to tease apart associations at the between- and within-person levels, and these associations do not always show the same magnitude or even the same direction (Hoffman & Stawski, 2009; Kievit et al., 2013). Kievit et al. (2013) showed an extreme but very illustrative example where the association between alcohol intake and IQ was positive at the between-person level, but for each person over time, the same association was negative (cf. Simpson’s paradox; Simpson, 1951). Different associations at the between- and within-person levels have also been found in SDT-based physical education research (Gillison, Standage, & Skevington, 2013). At the between level, the results suggested that students perceived greater lesson value and formed stronger future intentions to exercise in a controlling, extrinsic goal–focused condition. At the within level, the results were the opposite, indicating that students perceived greater lesson value, positive lesson-related outcomes (i.e., motivation, effort, enjoyment, value, exercise-induced affect), and future intention to exercise in the autonomy-supportive, intrinsic goal–focused condition. Increased attention to associations at different levels (i.e., between- and within-person levels) will force researchers to more thoroughly specify their hypotheses and whether similar associations can be expected when athletes are compared to other athletes and when they are compared to themselves over time.

The bifactor ESEM framework (Morin et al., 2015) applied in Study 3 also provides researchers with a statistical tool that corresponds well to research questions of interest in sport psychology. The statistical analysis that researchers choose do not always correspond to theory, such as theories about time, change, associations between variables, or theory underlying the measures used in a study. Morin et al. (2015) have provided a statistical framework that corresponds well to research questions of interest in sport psychology, referring to distinct sources of psychometric multi-dimensionality.
Suggestions for Future Research

Suggestions for future research have been provided in various sections, and I will summarize some of these suggestions here and provide some new ones. First, more research is warranted on the leadership process in sports as a dynamic process that coaches and athletes jointly produce. Focusing on dyadic patterns could be one way of addressing this issue, in which both athletes’ and coaches’ behaviors and motivation could be assessed repeatedly over time in intensive longitudinal designs (e.g., Bolger & Laurenceau, 2013). A focus on dyadic patterns in intensive longitudinal designs could be one way of further identifying reciprocal or reversed associations (e.g., feedback loops) between coaches’ interpersonal styles and athletes’ motivation, behaviors, and well-being.

Second, in Study 2, we observed a relatively small mean-level change in athletes’ perceptions of controlling behaviors, but we also observed that there was heterogeneity in how athletes’ perceptions changed over time. Future research could try to further understand this heterogeneity and why athletes’ perceptions differ. A useful statistical framework for this would be to apply growth mixture modeling (e.g., Morin & Wang, 2016), in which subgroups in the sample with different growth trajectories can be identified. These subgroups can then be predicted to advance knowledge on why they differ or can be used as predictors to examine what the consequences are of having different growth trajectories (e.g., Asparouhov & Muthén, 2014). Following this line of thought of interactive effects, future research should also focus more on the interactive effects of different contextual factors. Recent research indicates that there are interactive effects of coaches’ and parents’ autonomy support on athletes’ motivation and performance (Amorose, Anderson-Butcher, Newman, Fraina, & Iachini, 2016; Gaudreau et al., 2016), but other social agents, such as peers and teachers, also influence athletes’ experiences in sport. Keegan et al. (2010) coined the term “motivational atmosphere” to reflect the apparent supercomplexity of the social milieu in determining athletes’ motivation (see also Keegan, Harwood, Spray, & Lavalle, 2011). Taking a more holistic approach and focusing on the individual and interactive effects of various contextual factors simultaneously would further advance our understanding of the motivational atmosphere influencing athletes’ motivation.

Third, in addition to expanding the SDT-based leadership research to include structure and involvement as important interpersonal styles, variations of autonomy (or need) support and controlling interpersonal styles should also be the focus of future research. Research has been conducted on variations of these interpersonal styles, such as autonomy-supportive change-oriented feedback (Carpentier & Mageau, 2013), multidimensional conceptualizations of autonomy support (i.e., interest in athletes’ input and praise for autonomous behavior; Conroy & Coatsworth,
2007), the integration of SDT and achievement goal theory into higher-order constructs of empowering and disempowering motivational climates (Appleton, Ntoumanis, Quested, Viladrich, & Duda, 2016; Solstad et al., 2016), and coaches’ intervention tone, indicating the psychological meaning that the particular expression of that content conveys (Erickson & Côté, 2016). Such developments have the potential of enhancing our understanding of the active ingredients of coaches’ interpersonal styles that influence athletes’ behaviors and motivation.

Fourth, there is a need for SDT-based coach interventions to improve interpersonal coach behaviors (cf. Evans, McGuckin, Gainforth, Bruner, & Côté, 2015; Landers, 1983; Langan et al., 2013). The field would benefit from integrating SDT-based coach interventions with frameworks for intervention implementation, such as the DIEM (Schwarz et al., 2016) or other models, such as the transfer of training model (Baldwin & Ford, 1988; see also Stenling & Tafvelin, 2016). Using such frameworks provides researchers with tools for designing detailed interventions that are contextualized and match the needs of the participants, as well as the possibility of gaining a deeper understanding of individual factors, training-design factors, and work-environment factors influencing the transfer of new skills and knowledge from training to practice.

Some Final Remarks
In the beginning, I outlined my epistemological and ontological positions, stating that I adhere to a pragmatist philosophy of science (cf. Dewey, 1938; James, 1907; Martela, 2015; Peirce, 1931; Zyphur & Pierides, 2015). But what constitutes a pragmatic way of doing research? Martela (2015) identified three essential elements of a pragmatic approach for conducting research:

First there is the connection to practice, doing research with ends-in-view. Second, there is the fallible abductive process of inference through which the researcher aims to gain insight into the question at hand. And third, there is the collective dimension of inquiry, the way the researcher interacts with other members of the scientific community and in the end aims to convince them about the soundness of one’s insights. (p. 553)

Dewey (1938) argued that the outcome of a successful inquiry is a transformation of the situation, meaning that the most basic conception of inquiry is the determination of the indeterminate situation. Hence, through pragmatism, scholars are encouraged to show how theoretical differences make a real difference to practice (Parmar, Phillips, & Freeman, 2016).
Given the topic of the present thesis, one might also wonder how this pragmatic philosophy of science is related to contemporary leadership research in sports. In a recent opinion paper, Cruickshank and Collins (2016) argued that leadership research should aim to be more cognitively oriented, behaviorally balanced, and practically meaningful. The latter point was directly linked to a pragmatic approach to research philosophy for applied sport psychology (cf. Giacobbi et al., 2005). To elaborate a bit on these points, the authors argued that it is time to advance leadership research in sports by leveling out the behavior-cognition imbalance, which currently is skewed in favor of the former. Researchers have primarily focused on the identification of effective behaviors, that is, what leaders overtly do, rather than why and how they lead in a certain way at a certain time. They also argued that there has been an overreliance on positivist/post-positivist research on the bright side of leadership and that current knowledge has not sufficiently accounted for the “it depends,” nested, or darker elements of optimal applied leadership. Finally, Cruickshank and Collins (2016) argued that closer attention is needed to the full spectrum of leadership intentions and behaviors, professional judgments, and decision-making that underpins successful practice. I agree with the calls that Cruickshank and Collins (2016) put forward, and they are well-suited for a pragmatic approach to leadership research. A pragmatic approach to leadership research could also aid seeing the practical problems from the inside through the lived experiences of leaders in sports, and it could show how theoretical differences make a real difference to leadership practice (cf. Parmar et al., 2016).
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“A wizard is never late, Frodo Baggins. Nor is he early. He arrives precisely when he means to.”

- Gandalf

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Andreas Stenling