Relatedness support in physical education: Development and evaluation of evidence-based initiatives

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Cassandra R Sparks        Date
Explanatory Note

The University of Western Australia Graduate Research School guidelines specify that PhD candidates have the option to present their thesis as a series of manuscripts (i.e., thesis-by-papers). This thesis has been compiled in accordance with these guidelines and includes manuscripts that have been published or are under review. In light of the thesis being presented as a series of manuscripts, it is inevitable that there will be some degree of redundancy between chapters (e.g., degree of repetition in some introductory material).

However, consistent with University of Western Australia Graduate Research School guidelines, the manuscripts have been amended for presentation in this thesis so as to remove material that is unnecessarily repetitious or disrupts the flow of the thesis. Consistent with the guidelines, the manuscripts have also been amended to include (a) a foreword that introduces each chapter and establishes its links to previous chapters and (b) references that cite previous chapters rather than references to the corresponding published or submitted manuscripts. Throughout the thesis, tables and figures are labelled according to their number within the respective chapter. For example, Table 2.1 refers to the first table within Chapter II. Additionally, although the present thesis is the work of Cassandra Sparks, the thesis chapters make use of the active voice (e.g., terms such as “we” and “our” instead of “I” and “my”). The active voice is used in accordance with scientific guidelines and in recognition of the collaborations with co-authors on the published and submitted manuscripts.
Statement of Candidate Contribution

DECLARATION FOR THESES CONTAINING PUBLISHED WORK AND/OR WORK PREPARED FOR PUBLICATION

This thesis contains published work and/or work prepared for publication, some of which has been co-authored. The bibliographical details of the work and where it appears in the thesis are outlined below. The student must attach to this declaration a statement for each publication that clarifies the contribution of the student to the work. This may be in the form of a description of the precise contributions of the student to the published work and/or a statement of percent contribution by the student. This statement must be signed by all authors. If signatures from all the authors cannot be obtained, the statement detailing the student’s contribution to the published work must be signed by the coordinating supervisor.

Chapter II.


Student contribution:
Review of literature, study design, data collection and analyses, manuscript write-up.

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Summary

The aim of this thesis was to contribute to the understanding of relatedness-supportive instructional practice in physical education. In pursuing this aim, I sought to qualitatively investigate indicators of relatedness support, quantitatively examine relatedness-supportive indicators, alongside various student outcomes of relatedness-supportive teaching, and examine whether a professional development program targeting relatedness-supportive teaching would lead to increases in students’ perceptions of relatedness support.

In Chapter I, I focus on relevant work from both general and physical education domains that have utilised a Self-Determination Theory (SDT) framework, with special attention given to the psychological need for relatedness. Chapter II focuses on exploring the specific teacher behaviours that students deem to be relatedness-supportive in physical education. In Chapter III, I direct my attention to empirically examining the indicators of relatedness support as identified in Chapter II, as well as the outcomes associated with relatedness-supportive teaching. Grounded in the conceptualisation and measurement outlined in Chapters II and III, Chapter IV focuses on the development, application and evaluation of a physical education teacher training program focused on enhancing students’ relatedness-support perceptions. Finally, in Chapter V, I review the information presented in Chapters I to IV, consider the limitations and implications of this work, and present suggestions for future research.

This thesis comprises an analysis of data collected across three separate studies involving participants drawn from high school physical education classes. This thesis contributes a novel, and more comprehensive understanding of relatedness-supportive teaching in the context of physical education. Through the use of semi-structured focus
group interviews, and the subsequent quantification of relatedness support themes as identified by high school physical education students, support is given to a network of indicators of relatedness-supportive teaching. Further support for this model is demonstrated through preliminary evidence that, collectively, these indicators may be related to a number of positive student outcomes. Lastly, this work shows the effects of an intervention program based on relatedness-supportive principles, and adds to the extant SDT literature by focusing exclusively on the physical education teacher’s ability to be more warm, caring, inclusive, and supportive. It is concluded that the detailed exploration of relatedness-supportive teacher practices in physical education has important conceptual and practical implications.
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Chapter I. General Introduction: Literature Review and

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Chapter I Foreword

It is well known that regular participation in physical activity is important for the healthy development of young people. There is a vast amount of scientific evidence highlighting the positive effects of regular physical activity participation; evidence that links regular physical activity participation to the prevention of various chronic diseases, the support of healthy bone development, improvements in mental health, and the maintenance of one’s health across the lifespan (Strong et al., 2005; Warburton, Nicol, & Bredin, 2006). Global physical activity recommendations for individuals aged 5-17 encourage an accumulation of at least 60 minutes of moderate-to-vigorous-intensity physical activity every day in order to achieve health benefits (World Health Organization, 2010). However, despite the acute and long-term benefits of physical activity participation, a large proportion of children and adolescents lead insufficiently active lifestyles (Biddle, O’Connell, & Braithwaite, 2011).

A key issue in physical activity research is developing an understanding of the motivational forces underlying one’s engagement (or not) in a behaviour, and the different environmental conditions and social agents that support one’s participation. Interpersonal interactions between individuals and their peers, coaches, teachers, and parents all help to shape the quality of their physical activity engagement and experiences (Standage & Emm, 2014). With marked decrements in levels of physical activity occurring when children enter their adolescent years (Biddle, Gorely, & Stensel, 2004), school-based physical education (PE) has been recognised as an important context to help young people achieve the recommended amount of physical activity (Fairclough & Stratton, 2005), to prevent sedentary lifestyles and associated diseases (Ekelund et al., 2012), and to influence adult levels of physical activity (Telama et al., 2005). With this in mind, a primary concern for
researchers is to understand the diverse motivational profiles of students within the PE classroom to allow educators the knowledge and tools to promote growth, learning, and life-long engagement with sport and physical activity.

In seeking to understand the ways in which students’ in-class perceptions and experiences are shaped, much of the education psychology literature – both within and beyond PE – has focused on the role of the teacher in determining motivational dynamics within the classroom (see Furrer & Skinner, 2003; Koka & Hagger, 2010). As people have an innate need to feel connected to, and part of meaningful relationships with others (Deci & Ryan, 2000), a particular emphasis of this literature review will be given to the role of the PE teacher in creating quality (i.e., close, supportive) social interactions with their students, and the effect of such bonds on student motivation. Given our focus on the social-motivational processes within PE, the overarching theoretical framework upon which this thesis is based is Self-Determination Theory (SDT; Deci & Ryan, 1985), which will be discussed in detail throughout this literature review. Following a discussion of the theoretical underpinnings of SDT, Chapter I will focus on relevant work from both general and physical education domains that have utilised a SDT framework. With students’ basic psychological needs in mind, emphasis will be placed on the role of the teacher in providing classroom conditions that support students’ self-determination via need fulfillment. Special attention will be given to the psychological need for relatedness, how this psychological construct relates to student motivation, and the possible mechanisms through which teacher relatedness support links to adaptive student outcomes, both within and beyond PE.
Self-Determination Theory

The study of motivation has been central to understanding human behaviour and the factors that direct persistent, goal-related actions. Accordingly, motivation researchers have sought to not only investigate the social conditions and processes that influence persistence, but also the perceptions and consequences of one’s actions. Most theories of human motivation, therefore, aim at least in part to understand the effects of the social environment on individuals’ functioning. Traditionally, much of this work treated motivation as a singular construct (Ryan & Deci, 2000), and failed to address why certain behaviours and outcomes are pursued or desired (e.g., Bandura, 1997a). In addition, this work also treated motivation as a construct that varies primarily in quantity (e.g. Baumeister & Vohs, 2007), assuming that the greater one’s motivation, however measured, the greater one’s drive for performance and achievement (Deci & Ryan, 2008). Taking into consideration the notion that individuals might experience qualitatively different types (as well as different levels) of motivation, Deci and Ryan (1985; 2000; 2008) proposed a broad framework for the study of human motivation that has guided a wealth of research in physical activity and education settings.

SDT (Deci & Ryan, 1985) is a theory of motivation in which it is proposed that humans are driven by inherent tendencies for psychological growth and fulfillment, and may experience substantively different types of motivation within a given context. Research guided by SDT has focused on various social-contextual factors that facilitate or thwart individuals’ motivation and psychological well-being, on the premise that an individual who acts on his/her own volition and initiative will be more persistent and proactive in his/her endeavours (Ryan & Deci, 2000). Within SDT, more desirable forms of motivation are referred to as being ‘autonomous’ or ‘self-determined’ in nature, and reflect
participation in an activity due to the enjoyment or interest one derives from it, its consistency with one’s identity, and/or the valuable outcomes that it provides. A significant body of research comparing individuals who report strong self-determined motivation with those who endorse more controlling or externally-driven motives (e.g., obtaining rewards, avoiding punishment or guilt) has shown that self-determination is associated with greater excitement and confidence with regards to the activity (Ryan & Deci, 2000), leading to enhanced performance, persistence, and creativity. Importantly, SDT has demonstrated that motivation may be characterised not only in terms of its strength, but also its quality, and in the following section, this notion, and the concept of internalisation, are discussed in more detail.

**Differentiation of motivation.** This section of the literature review will examine the various forms of motivation outlined within SDT, beginning with the distinction between intrinsic and extrinsic motivation (Deci & Ryan, 1985, 2000). The focus will then shift to autonomous versus controlled motivation. Various SDT mini-theories will be discussed in relation to the facets of motivation as defined by SDT.

**Intrinsic motivation.** Although the concept of intrinsic motivation has a rich history in psychology (DeCharms, 1968; Hunt, 1965; White, 1959), from the perspective of SDT intrinsic motivation represents the inherent tendency for people to engage in and seek out optimally challenging tasks. In other words, an activity for which one is intrinsically motivated is undertaken “for it’s own sake” (Ryan & Deci, 2000), and describes the inclination towards tasks that are interesting and enjoyable. The innate human capacity for intrinsic motivational tendencies is a critical element for cognitive, social, and physical development via a drive to attain knowledge and skills. Taken together, intrinsic motivation
represents an adaptive form of motivation through which performance, persistence, and well-being throughout life is affected (Ryan & Deci, 2000).

Much of the early work in this area focused on the differences between intrinsic motivation and extrinsic motivation, which refers to behaviours driven by some separable outcome. To demonstrate the contrast between intrinsic and extrinsic motivation, considerable research has been conducted to investigate what happens when people are provided with extrinsic rewards during an intrinsically interesting activity, and subsequent effects on intrinsic motivation. It was proposed that by presenting people with external (controlling) events (e.g., punishment, rewards, evaluation) during an optimally challenging task, intrinsic motivation would be undermined. Various studies were conducted to test this concept, and it was found that extrinsic rewards (see Deci, Koestner, & Ryan, 1999), as well as various threats (e.g., punishment, deadlines, and surveillance; Amabile, Dejong, & Lepper, 1976; Plant & Ryan, 1985), aligned with decreased intrinsic motivation. However, it was found that offering control (i.e., self-determination) enhanced intrinsic motivation (Zuckerman, Porac, Lathin, & Deci, 1978). From these findings, Deci and Ryan (2000) argued that people who are intrinsically motivated feel a sense of autonomy (i.e., control, volition), while people who are offered rewards or feel pressured/threatened (for instance) tend to feel controlled, and under these conditions experience less autonomy. In contrast to tangible rewards, another group of studies examining the effects of positive and negative feedback on intrinsic motivation found that positive performance feedback enhanced intrinsic motivation through a sense of competence, whereas negative performance diminished it (Vallerand & Reid, 1984).

To help explain the variability in intrinsic motivation, Ryan and Deci (1985) presented Cognitive Evaluation Theory (CET), SDT’s first mini-theory, which considers
the social and environmental factors (i.e., external events) that facilitate or undermine intrinsic motivation. More specifically, CET considers social-contextual events (e.g., rewards, feedback, ego-involvements) that support or undermine feelings of autonomy (i.e., feeling like we are the initiators if our decisions and that our behaviours reflect our and choices), and competence (i.e., feeling proficient to successfully carry out our pursuits). Several studies have shown support for the presence of positive performance feedback (i.e., competence support) versus negative performance feedback for enhancing intrinsic motivation (e.g., Harackiewicz, 1979). Accordingly, CET also specifies that in order to enhance or maintain intrinsic motivation through experienced competence, a sense of autonomy (or internal perceived locus of causality; deCharms, 1968) must be present (Ryan, 1983; Ryan & Deci, 2000a). In other words, in order for people to feel intrinsically motivated, they must experience satisfaction of the needs for both autonomy and competence. As a result, most of the laboratory work in the 1970s and 1980s looked at how external (controlling) events worked to undermine intrinsic motivation, as well as the specific external events which facilitate intrinsic motivation through the satisfaction of autonomy and competence. In summary, the presence of tangible rewards, threats, deadlines, directives, pressured evaluations, and imposed goals undermine intrinsic motivation because they diminish autonomy and competence, while choice, positive feedback, acknowledgement of feelings, and opportunities for self-direction facilitate intrinsic motivation through feeling a sense of autonomy and competence (Deci & Ryan, 1985, 2008; Patall, Cooper, & Robinson, 2008). Across various domains, field studies have further shown that teachers, parents, and mentors (e.g., coaches) who are more autonomy-supportive versus controlling and well-structured and competence-facilitating instead of unorganised and critical have students and children who are more intrinsically motivated.
(Frederick & Ryan, 1995; Grolnick, Deci, & Ryan, 1997; Hagger & Chatzisarantis, 2007; Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008b; Niemiec & Ryan, 2009; Standage, Duda, & Ntoumanis, 2006). While CET is predominantly focused on the social-contextual events that support or undermine feelings of autonomy and competence, Ryan and Deci (2000) also recognised a third need, relatedness (i.e., feeling that one is understood by, cared for, and connected to important others), which also bears on experiences of intrinsic motivation. For example, Ryan and Grolnick (1986) observed lower levels of intrinsic motivation in students who reported their teachers to be cold and uncaring. While proximal relational supports may not be entirely necessary to intrinsic motivation (e.g., isolated tasks/behaviours), SDT indicates that intrinsic motivation is more likely to flourish in environments characterised by a sense of security and relatedness (Ryan & Deci, 2000).

Considering the focus of this thesis is on the psychological need for relatedness, and how this construct relates to student motivation (both within and beyond PE), a more detailed discussion will be presented in subsequent sections and throughout the entire document.

In considering the CET framework, it is evident that strong links exist between intrinsic motivation and the satisfaction or thwarting of the needs for autonomy, competence, and (perhaps in a more distal sense) relatedness. Nevertheless, the principles of CET fall short in explaining motivation for an activity if the activity in question does not hold intrinsic value (i.e., interest, enjoyment). To understand motivation for those activities, we will now address extrinsic motivation and the presentation of SDT’s second mini-theory: organismic integration theory (OIT).

**Extrinsic motivation.** Although intrinsic motivation is important for supporting goal-directed behaviour, motivation to engage in a behaviour is not always derived exclusively from intrinsically rewarding reasons. Indeed, beyond one’s childhood, the
freedom to be intrinsically motivated is limited given the increase in social pressures to partake in activities that are not inherently interesting. It is therefore important to consider how individuals may, at times, be motivated to carry out behaviours that are extrinsically motivating in nature and how this may affect well-being and behavioural outcomes.

In contrast to intrinsic motivation, extrinsically-motivated behaviours reflect engagement in an activity in order to achieve some separable outcome (e.g., gain reward, avoid punishment). Early research focused on the supposed antagonistic nature between intrinsic and extrinsic motivation (e.g., Deci, 1971), and assumed that extrinsically motivated behaviours were not self-determined in nature. Built around the concept of internalisation, Deci and Ryan (1985) proposed a second sub-theory called organismic integration theory (OIT). Within SDT, internalisation is viewed as a motivational process through which behaviour that requires external contingencies is transformed into an internal regulation by the “taking in” of values, beliefs, or attitudes as one’s own (Deci, Vallerand, Pelletier, & Ryan, 1991). Optimal internalisation occurs when a person fully endorses the behaviour (i.e., autonomous motivation). Less optimal forms fall at different points along an autonomy continuum, and depend on the extent to which internalisation and integration is experienced. OIT details different forms of extrinsically motivated regulations that exist along this continuum, representing more self-determined (or autonomous) versus more controlled motives (Deci & Ryan, 1985; Ryan & Connell, 1989). More specifically, autonomous motives represent participation in an activity for volitional reasons, such as fun, interest, value, and enjoyment, whereas controlled motives represent behaviours driven by external/self-imposed contingencies. Figure 1.1 illustrates the OIT taxonomy, identifying the four types of extrinsic motivation: external, introjected, identified, and
integrated forms of regulation, which vary in their degree of internalisation (i.e., autonomy).

At the far left of this extrinsic motivation continuum, the most controlled (non-autonomous) motive is \textit{external regulation}, and represents behaviours performed to satisfy external demands (e.g., working hard solely to gain a pay raise) or attain various rewards (Ryan & Deci, 2000). According to this continuum, the next regulation (and more autonomous than external regulation) is \textit{introjected regulation}, which refers to behaviours pursued in order to attain pride or avoid guilt and shame (Deci & Ryan, 2008). Both external and introjected regulations reflect pressures – either externally or internally imposed – and are described within the literature as controlled motivation constructs (Ryan & Deci, 2000). A more autonomous form of extrinsic motivation is \textit{identified regulation}. Identified regulation reflects the conscious valuing of an activity characterised by acceptance or personal relevance to the action at hand (Ryan & Deci, 2000). Finally, the most autonomous, or self-determined, form of extrinsic motivation is \textit{integrated regulation}. 

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{motivation_continuum}
\caption{Self-determination continuum depicting motivation types and regulatory styles}
\end{figure}
Integrated regulation reflects behavioural regulations that are fully assimilated within a person’s identity and core values. Although integrated regulation shares characteristics with intrinsic motivation, it is still considered to be extrinsic as the behaviour is still performed to attain some separable outcome (as opposed to the inherent enjoyment the activity brings) (Ryan & Deci, 2000). To illustrate these extrinsic regulations in the context of PE, outside of participating due to the inherent enjoyment or interest that the activity brings (i.e., intrinsic motivation), it is possible that a student may participate because s/he (a) wants to avoid being punished for not participating (i.e., external regulation), (b) would feel guilty for not participating in PE (i.e., introjected regulation), (c) values the fitness benefits that come through participation (i.e., identified regulation), or (d) feels that being active is part of his/her identity (i.e., integrated regulation).

**Autonomous and controlled motivation.** The understanding of internalisation and different regulations within SDT has shifted the focus away from early discussions of intrinsic versus extrinsic motivation, and instead, has focused attention toward the notion of autonomous versus controlled motivation. Although the regulations presented along the SDT continuum all reflect people’s intentions to act, the outcomes (or behavioural ‘signatures’) associated with each motive may differ. A significant body of research has examined outcomes of autonomous and controlled motivations within different settings, and consistently, autonomous motivation for a given activity has been related to greater effort, more positive affect, enhanced performance, and greater psychological well-being. For example, autonomous (relative to controlled) motivation has been shown to promote enhanced engagement and persistence at school (e.g., Guay, Ratelle, Roy, & Litalien, 2010; Reeve, 2012), greater engagement in physical activity and sport (e.g., Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002; Vansteenkiste, Simons, Soenens, & Lens, 2004), higher
levels of vitality and psychological well-being (e.g., Nix, Ryan, Manly, & Deci, 1999), and effective behaviour change (e.g., Ng et al., 2012), among other positive outcomes. As intrinsic motivation and more autonomous forms of extrinsic motivation are associated with positive outcomes, much of the work utilising an SDT framework has concentrated on the social conditions that facilitate internalisation and support autonomous motivation. The conceptualisation of basic needs theory emerged as a framework for understanding how aspects of one’s environment might support the development of autonomous motivation.

**Basic needs theory.** Up to this point, we have introduced and discussed both autonomy and competence as proposed by CET, and to a lesser extent, the concept of relatedness. In considering the factors that facilitate internalisation, another SDT mini-theory introduced a third need, *relatedness*, given its importance to the “taking in” of social norms and values. Subsequently, basic needs theory (BNT; Deci & Ryan, 1985, 2000), proposed that innate psychological needs – namely autonomy, competence, and relatedness – are central to human growth and motivation. SDT researchers have focused on these three basic psychological needs as a way to understand how one’s motivational regulation may be shaped by aspects of the environment. The theory posits that individuals’ basic psychological needs can be satisfied when important others engage in behaviours that are designed to support one’s need satisfaction. Specifically, a feeling that one is understood by, cared for, and connected to important others (i.e., relatedness), proficient to successfully carry out our pursuits (i.e., competence), and the initiator of decisions and behaviours that reflect one’s aims and choices (i.e., autonomy), are proposed to facilitate the internalisation of values and behaviours endorsed within a given setting (Deci & Ryan, 1985).

Subsequently, ‘need supportive’ environments that cater to these needs provide an important environmental scaffold through which individuals experience need satisfaction,
and thus, endorse relatively more self-determined forms of motivation. Emphasizing the aforementioned relationship, Vallerand (1997) proposed a comprehensive model of motivation highlighting the influence of social factors on motivational types exerted through the satisfaction of the basic psychological needs. Perceptions of highly autonomy-, competence-, and relatedness-supportive environments, therefore, are theorised to indirectly support various desirable outcomes (e.g., engagement, persistence, well-being), via their positive relations with need satisfaction and autonomous motivation (see Vallerand (1997); social factors → psychological mediators → types of motivations → behavioural/affective consequences). As we are mainly concerned with the application of SDT within the PE classroom, we will now shift the focus to a review of research considering the relationships between need-supportive school settings, need satisfaction, and various student outcomes.

**Motivation in Education: A SDT Perspective**

In the classroom, students interact within a context that may support or thwart the satisfaction of their needs, goals, interests, and values. Consistent with the literature already reviewed, the application of SDT within the classroom assumes that all students possess psychological needs which facilitate high-quality motivation and engagement when adequately supported (Deci et al., 1991; Reeve, Deci, & Ryan, 2004). Self-determined motivation and associated educational outcomes have been studied across various school contexts, ranging from early elementary school to college and university settings. In the classroom, the learning environment provided by the teacher is critical to supporting students’ basic psychological needs, and in the following section, the focus is on research that has examined the role of teachers in shaping student motivation within the classroom.
**General education.** When applied to educational contexts, SDT (Deci & Ryan, 1985; Deci et al., 1991) offers insight into how classroom environments stimulate students’ interest in learning, value of education, and engagement in class activities. Accordingly, a great deal of research has been targeted at understanding the teacher instructional styles that support students’ autonomy, competence, and relatedness needs. Generally speaking, autonomy support has received the greatest research attention within the classroom setting, and recently an effort has been made to clarify the combined and unique effects of students’ perceptions of teacher autonomy support and structure (i.e., competence support). Less attention has been directed towards the conditions that support students’ relatedness need satisfaction, and the specific teacher behaviours that facilitate adaptive student outcomes through the fulfillment of relatedness. The primary focus of this doctoral thesis is to further our understanding of the teacher behaviours most likely to support students’ relatedness needs. That being the case, a brief review of autonomy and competence support in the classroom is presented below, followed by a more detailed section highlighting the work specific to students’ experiences of relatedness and connection to their teacher (drawing from research based in SDT specifically, as well as education and pedagogy more broadly).

**Autonomy Support.** An autonomy supportive teacher provides students with choice, considers their viewpoints, fosters understanding and interest toward learning, gives rationales for activities, and encourages independent thinking (Assor & Kaplan, 2001; Reeve, 2002). In fact, considerable work has focused on conceptualising the provision of autonomy support (see Su & Reeve, 2011), and empirical support exists for providing meaningful rationales, acknowledgment of negative feelings, use of non-controlling language, offering choice, and nurturing inner motivational resources as teacher behaviours that serve to support students’ autonomy in the classroom (Assor, Kaplan, & Roth, 2002;
Reeve & Jang, 2006). Furthermore, autonomy supportive teaching has been linked to various adaptive educational outcomes such as student engagement (Reeve, Jang, Carrell, Jeon, & Barch, 2004), higher academic achievement (Black & Deci, 2000; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005), deeper level learning (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004), and more self-determined forms of motivation (Deci et al., 1991).

**Competence Support.** In terms of facilitating competence within the classroom, teachers can support students’ needs by providing structure. Structure refers to the provision of clear instruction surrounding classroom goals, rules and expectations, offering help and guidance during learning activities, and giving positive, constructive feedback to students during and after an activity (Reeve, 2006). Importantly, structure nurtures competence need satisfaction when it contributes to students feeling that they are able to understand and effectively master the task at hand. Within the classroom, research grounded in SDT has mainly focused on the role of feedback, and has linked the provision of positive feedback to intrinsic motivation (Jang, Reeve, Ryan, & Kim, 2009) and engagement (Skinner & Belmont, 1993; Tucker et al., 2002). Frequently, relations between autonomy and structure have been defined as antagonistic in nature. However, Reeve (2002) contended that autonomy support and structure should exist together in a complementary way. Work by Sierens, Vansteenkiste, Goossens, Soenens, and Dochy (2009) found through confirmatory factor analysis that autonomy support and structure form two different, yet positively related, teaching dimensions. Further work by Vansteenkiste et al. (2012) focused on the synergistic effects of providing both autonomy support and structure within the classroom. Results from their study indicate that when
teachers provide adequate structure (e.g., clear instructions and expectations) in an autonomy supportive way, students are more likely to display adaptive outcomes.

**Relatedness Support.** The idea that humans strive to form and maintain close interpersonal bonds is well established. Many theories, including those with an emphasis on attachment (Ainsworth, 1989; Bowlby, 1969), affiliation (McClelland, 1985), belonging (Baumeister & Leary, 1995), and connectedness (Weiner, 1990), propose a desire or tendency for *relatedness*, and this work has been grounded in the idea that fostering close ties to significant others or groups is important for cognitive, emotional, and behavioural outcomes. Accordingly, SDT contends that all humans have the fundamental psychological need to experience relatedness—that is, to feel personally connected to, accepted by, and cared for by significant others (Deci & Ryan, 2000). Relatedness can be understood as the process through which we experience key figures as supportive, understanding, caring and invested, which in turn helps individuals to take in and accept as their own external ways of thinking, feeling or behaving (Ryan & Connell, 1989). Within educational contexts, student-teacher relationships are crucial for developing effective learning environments, and as a result, it is important to consider how teachers may facilitate supportive and inclusive (i.e., relatedness-supportive) relationships with their students.

From a SDT perspective, teacher relatedness support (also referred to as interpersonal involvement) within the classroom is theorised to support students’ relatedness needs. As relatedness reflects our striving for belonging and support, relatedness support reflects behaviours that facilitate inclusiveness and connection to others. Relatedness support is characterised by the provision of a caring, friendly, and supportive environment that is devoted to promoting students’ well-being and cohesion within the classroom (Ryan & Powelson, 1991). Teacher involvement has been positively
related to engagement in the classroom (Skinner & Belmont, 1993), intrinsic motivation, interest, and academic effort (Furrer & Skinner, 2003; Ryan & Grolnick, 1986). Indeed, feeling relatedness toward significant others is critical to the process of internalisation, which is a driver of autonomous motivation (Deci & Ryan, 1985). Without close connection to relevant others, behaviour may be driven to a greater extent by external or introjected reasons.

Furrer and Skinner (2003) examined the role of children’s sense of relatedness to important others (i.e., parents, teachers, peers) in a sample of students ($n = 641$) from third to sixth grade. The results showed that students’ who felt appreciated and cared for by teachers were more likely to report engagement in classroom activities as intrinsically worthwhile (e.g., fun, interesting), and felt happy and comfortable in class, while students who felt unimportant or ignored by their teacher reported more boredom, unhappiness, and anger while participating in learning activities. Other relevant literature has identified similar aspects of the classroom environment, namely ‘teacher support’ and ‘pedagogical caring’, which closely relate to the teacher provision of relatedness support. Similar to SDT, this work is based on the notion that feelings of belongingness and being cared for facilitate the adoption of goals and values of important others (Baumeister & Leary, 1995), suggesting that students will be more motivated to engage if they believe their teacher cares about them. For instance, work by Wentzel (1997) focused on the role of perceived caring from teachers in relation to students’ motivation in the eighth grade ($n = 375$), and found that perceptions of a caring teacher were significant predictors of students’ pursuit of social goals and academic achievement. Taken together, feeling connected and feeling a sense of relatedness towards one’s teacher is important for student engagement and motivation in the classroom. Although the role of relatedness need satisfaction (and associated concepts,
such as ‘caring’) in shaping motivational outcomes is well established, less research attention has been directed toward the teacher behaviours that are viewed as relatedness-supportive in nature; that is, the specific behaviours employed by teachers inside and outside of the classroom that help students derive a sense of belonging and connection. Likewise, relatively little attention has been devoted to this issue within the PE classroom, and (relative to the provision of autonomy support) there is a gap in the literature regarding the interpersonally-involving teaching practices that might be used in PE to better motivate and engage students.

**Physical education.** Given the potential for PE to help young people achieve daily physical activity recommendations and create positive attitudes towards health and physical activity, PE-based studies have consistently focused on exploring the classroom-based factors that underpin optimal forms of motivation. Given the environmental processes that support autonomous motives in students (as discussed in previous sections), the principles underlying SDT are appealing within PE due to the social interaction that occurs in this context. If students experience external regulation for PE, important others (i.e., teachers) may be able to help them better internalise and integrate the value of PE and physical activity into their own lives. Significantly, it has been proposed that students who have more autonomous motives for PE are more likely to be physically active in contexts outside of school because they find being active enjoyable and meaningful (Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003). As a result, much of the SDT work within PE has examined the implications of students’ motivational regulations, and the extent to which teachers’ instructional styles may support more adaptive need satisfaction and motivational responses among students.
Similar to classroom (i.e., non-PE) settings, PE-specific studies have utilised BNT to explore student motivation and engagement. Studies investigating the relationships between need support provided by PE teachers and student need satisfaction have consistently demonstrated that perceptions of need support are positively related to need satisfaction among students (Koka & Hagger, 2010; Standage, Duda, & Ntoumanis, 2003; Taylor & Ntoumanis, 2007). One study conducted by Cox and Williams (2008), for example, investigated the extent to which teacher’s instructional practices related to fifth and sixth grade students’ need satisfaction in PE, and found that both perceived teacher support and mastery climate positively related to students’ perceived autonomy, competence, and relatedness. PE-based studies grounded in BNT have also established the importance of need satisfaction for student motivation in PE. For example, studies by both Standage, Duda, and Ntoumanis (2005), and Zhang, Solmon, Kosma, Carson, and Gu (2011) revealed that need satisfaction was positively related to self-determined/autonomous motives in high school PE students. More recent studies have also provided evidence for positive relationships between autonomous motivation and positive in-class and leisure-time outcomes. Students’ autonomous motivation in PE has been positively linked to PE engagement (Gairns, Whipp, & Jackson, 2015) and effort (Taylor, Ntoumanis, Standage, & Spray, 2010), future intentions to exercise (Hagger et al., 2003), and leisure-time physical activity (Jackson, Whipp, Chua, Dimmock, & Hagger, 2013; Standage, Gillison, Ntoumanis, & Treasure, 2012). Despite being largely cross-sectional in nature, these studies demonstrate the importance of teacher instructional practices that nurture students’ basic psychological needs, and the downstream effects that these practices may have on self-determined motivation. Nonetheless, the majority of these SDT-related studies have investigated the extent to which students believe their PE teachers are autonomy-supportive
or provide structure, at the expense of focusing on aspects relating specifically to relatedness support (see Van den Berghe, Vansteenkiste, Cardon, Kirk, & Haerens, 2014). The following section of this literature review examines work that has focused on the interpersonal style of PE teachers, including the specific autonomy-, competence-, and relatedness-supportive practices studied in relation to students’ motivation, engagement, and experiences in PE.

Support for student autonomy in PE has received the most attention out of the three needs, and a number of these studies have showed direct positive associations between students’ perceptions of teacher autonomy supportive behaviour (i.e., providing choice and rationales, reliance on non-controlling language, acknowledging students’ feelings) and self-determined forms of student motivation (Hagger et al., 2003; Hagger et al., 2009; Vansteenkiste, Simons, Soenens, et al., 2004). In one such study, Standage et al. (2006) investigated whether an autonomy supportive environment (as provided by the PE teacher) would positively predict students’ autonomy, competence, and relatedness. Results demonstrated that secondary school PE students’ perceptions of teacher autonomy support positively predicted satisfaction of all three needs, which in turn predicted greater self-determined motivation. Teacher provision of structure in PE has also been examined through the lens of SDT, with this work concentrating largely on the degree to which providing positive feedback predicts students’ self-determined motivation (Koka & Hein, 2003; Koka & Hein, 2005). Recent studies have also begun to examine the synergistic effects of teacher autonomy and competence supportive behaviours on student motivation in PE. Koka and Hagger (2010), for example, tested the effects of competence (i.e., teaching and instruction, situation consideration, and positive general and positive/negative non-verbal feedback) and autonomy supportive (i.e., democratic and autocratic) teacher
behaviours on students’ self-determined motivation in PE. Their path-analytic model indicated, in part, that competence-supportive teacher behaviours positively predicted students’ self-determined motivation through the satisfaction of the need for competence and relatedness, while autocratic (highly controlling) teacher behaviours negatively predicted students’ self-determined motivation directly.

Relative to support for autonomy and competence, less attention has been directed toward identifying the interpersonally-involving teacher behaviours that support students’ relatedness in PE. The study of the interpersonal factors associated with students’ perceptions of relatedness has been limited to teachers’ emphasis on cooperation (Ntoumanis, 2001), and provision of autonomy support (see Standage, Gillison, & Treasure, 2007), as well as emotional supportive teaching and the promotion of a mastery climate (Cox, Duncheon, & McDaid, 2009). Despite limited work that has been dedicated to understanding relatedness-supportive teacher practices in PE, studies by both Cox and Williams (2008) and Standage et al. (2003) showed that students’ perceptions of relatedness support in PE were a stronger predictor of self-determined motivation than were perceptions of autonomy and competence support. Recent work by Jackson et al. (2013) and Gairns et al. (2015) further demonstrated the importance of students’ relatedness supportive perceptions in PE settings. In particular, Jackson and colleagues found that PE students’ had stronger relational efficacy perceptions when they felt that their teacher created a highly relatedness-supportive environment, which in turn supported their own confidence in PE, autonomous motives for participation, and prospective leisure-time physical activity. Although this work exemplifies the importance of interpersonally-involving climates within PE, relatedness is often not the target of needs-focused work in
this context, and the specific ‘supports’ (i.e., techniques or behaviours) that serve to satisfy students’ feelings of relatedness in PE settings are not fully understood.

Many of the PE studies that have modeled relatedness support have utilised an existing 5-item questionnaire (Standage et al., 2005) to measure students’ perceptions of their teacher’s relatedness-supportive behaviours. Compared to the instruments used to measure teacher autonomy and competence support, the range of relatedness behaviours captured in this existing relatedness support instrument is limited to single items reflecting the extent to which one’s teacher provides support, encourages working together, and is respectful, interested, and friendly toward their students. To further advance SDT-based work within the context of PE, investigations which serve to utilise a more detailed relatedness support measurement tool could be useful. Furthermore, little to no work has been conducted that has aimed to specifically manipulate or intervene on relatedness supportive teacher practices in PE. The following section reviews the few experimental and intervention studies that have strived to manipulate teachers’ need-supportive behaviours, and explore the subsequent effects on students’ need satisfaction, motivation and behavioural/affective outcomes.

**Experimental/Intervention-based Studies in PE.** Although cross-sectional studies have confirmed the motivational sequencing in PE as proposed by BNT (i.e., need support → need satisfaction → motivation → behavioural/affective consequences), intervention and experimental studies remain under-utilised within this context. Of the few experimental studies conducted, the majority have focused on the provision of autonomy and competence support, with far less attention devoted to the dimension of teacher relatedness support. Mouratidis et al. (2008b) experimentally examined the provision of positive competence feedback for PE students and found that feedback satisfying the need for competence
promoted students’ autonomous motivation, positive affect, and future intentions to participate. Experimental studies that have manipulated autonomy support have generally focused on the provision (or lack) of choice, and have demonstrated that students who are provided with choice in PE report greater autonomous motivation, more favourable perceptions of autonomy support, and display higher in-class physical activity levels than those within a control condition (How, Whipp, Dimmock, & Jackson, 2013; Lonsdale et al., 2013; Prusak, Treasure, Darst, & Pangrazi, 2004; Ward, Wilkinson, Graser, & Prusak, 2008). To our knowledge, very few studies have experimentally manipulated relatedness support. Mouratidis, Vansteenkiste, Sideridis, and Lens (2011) investigated whether the interest-enjoyment and vitality of Greek PE students varied as a function of different motivational environments. The motivational climate utilised in this study was differentiated teaching style (i.e., need supportive), which is characterised by providing various opportunities for choice (autonomy), and stimulated social cooperation (relatedness). Mouratidis et al. (2011) found that after a need supportive class, students reported greater interest-enjoyment and vitality, relative to a typical PE lesson (i.e., control group).

A limited number of intervention studies have sought to manipulate one or more of the basic psychological needs, and of these studies, the majority have focused on autonomy-supportive teacher practices. Overall, these intervention-based studies typically (a) invited PE teachers to participate in training based on SDT principles, (b) asked teachers to implement these strategies/practices into their PE classrooms for a prolonged period (i.e., weeks/months), and (c) assessed various student outcomes. Although limited, findings from these studies have shown that trained teachers are able to adopt various autonomy-supportive behaviours in their PE classes, and that students of trained teachers show
improvements in terms of motivation and other important PE-based outcomes (Aelterman, Vansteenkiste, Van den Berghe, De Meyer, & Haerens, 2014; Chatzisarantis & Hagger, 2009; Cheon & Reeve, 2015; Cheon, Reeve, & Moon, 2012; Tessier, Sarrazin, & Ntoumanis, 2008). Within PE, limited studies have incorporated features of relatedness support into their intervention’s teacher training programs. Tessier, Sarrazin, and Ntoumanis (2010) tested the effects of a training program based on all three psychological needs for newly qualified PE teachers. The main goal of the study was to promote students’ psychological need satisfaction, self-determined motivation, and engagement in class. Results from this study revealed that from pre-to-post intervention, newly qualified PE teachers were successful in adopting practices that were more autonomy, competence, and relatedness supportive. Despite substantial changes in teachers’ autonomy, competence, and relatedness supportive behaviours as rated by observers, students reported a significant increase only in relatedness, but no changes were found in their autonomy and competence need satisfaction from pre-to-post intervention.

Conclusions and Research Gaps

This chapter was designed to overview SDT, and highlight relevant school-based work—both within and beyond PE—that has examined the central tenets of this motivation framework. Particular emphasis was directed toward studies utilizing BNT, and the motivational sequence as proposed by this mini-theory (i.e., need support → need satisfaction → types of motivation → behavioural/affective consequences). Research conducted in educational settings has demonstrated the relevance of BNT, providing significant support for the beneficial effects associated with need-supportive teacher practices. In non-PE classrooms, perceived and manipulated need support has been found to predict students’ need satisfaction, higher quality motivation, engagement, and various
other affective/behavioural responses (see Reeve, 2012). In PE, the specific teacher instructional practices that students feel are supportive of their needs have also received empirical attention (Chatzisarantis & Hagger, 2009; Cheon et al., 2012); importantly though, much of this work has focused on autonomy- and competence-supportive teacher practices, with less attention devoted to support for relatedness (Standage & Emm, 2014; Van den Berghe et al., 2014). At present, limited attention has been directed toward charting the specific relatedness supportive or interpersonally-involving practices in which PE teachers engage, and the extent to which these behaviours satisfy students’ feelings of relatedness.

This thesis is based on identifying, measuring, and training the specific relatedness-supportive teacher practices that serve to support students’ relatedness needs. Accordingly, this review has focused on PE-based studies that have examined links between relatedness supportive teacher practices, student need satisfaction, and student motivation in PE. Feeling meaningfully related to significant others is critical to the process of internalisation (i.e., people’s “taking in” of attitudes, values, or opinions of others into one’s identity or sense of self), which is a driver of autonomous self-regulation (Deci & Ryan, 1985). In light of the fundamental need that individuals have for experiencing close interpersonal connections, and the central importance of relatedness need satisfaction for the internalisation of prescribed values and behaviours (Baumeister & Leary, 1995; Deci & Ryan, 2000), it is important to understand students’ perceptions about the distinct teacher behaviours that foster relatedness in PE. To date, studies isolating or manipulating relatedness-supportive teacher behaviours in PE are limited, despite literature demonstrating the role of relatedness supportive environments in shaping self-determined motivation (e.g., Cox & Williams, 2008; Standage et al., 2003).
This aim of this thesis is to explore the provision of relatedness support in the PE classroom. To date, no studies have examined the full range of specific teacher behaviours that students perceive to be relatedness supportive. In addition, there exists little intervention-based or experimental evidence regarding the effects of teacher relatedness support, making it difficult to infer causal relations between relatedness support, need satisfaction, and motivation in PE. In order to address gaps in the SDT literature, the aims of this doctoral work are to (a) explore in detail the full range of specific teacher behaviours that students deem to be relatedness supportive in PE (see Chapter II), (b) examine relationships between these relatedness supportive teacher practices, need satisfaction and motivation (see Chapter III), and (c) design, implement, and evaluate a theory-driven intervention designed to strengthen students’ perceptions of relatedness support (and selected downstream outcomes) in PE (see Chapter IV). The studies presented in this thesis promise to contribute new evidence-based, practical recommendations for educators in terms of enhancing students’ motivation in PE.
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Chapter II. “Getting connected”: High School Physical Education Teacher Behaviours that Facilitate Students’ Relatedness Support Perceptions

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Chapter II Foreword.

In Chapter I, I reviewed relevant literature pertaining to motivation and relatedness-supportive teaching from both general and physical education contexts. Following this review, several directions for future research were identified. In Chapter II, I address the first of these suggested research needs by exploring, through semi-structured focus group interviews, the full range of teacher behaviours that high school PE students identify as relatedness-supportive in nature, along with the outcomes students associate with warm, caring, and supportive teaching practice.
Abstract

Research within high school physical education (PE) has demonstrated that interpersonally-involving (or relatedness-supportive) environments are important for promoting student enjoyment, self-efficacy, and motivation in class. Yet to be explored in detail, however, is the full range of specific teacher behaviours that students deem to be relatedness-supportive, and the relevant student outcomes with which these behaviours are associated. Using a realist approach, 11 semi-structured focus group interviews were conducted with grade 8 and 9 PE students (males = 24, females = 24, \( M \) age = 13.54 years, \( SD = 0.58 \)), and data were content analysed using abductive principles. Teacher behaviours identified as highly relatedness-supportive emerged in relation to teacher communication, in-class social support, and behaviours associated with teacher attentiveness. Analyses also revealed a number of putative relatedness support outcomes reflecting affective responses and mood states, class engagement, intrinsic motivation, efficacy beliefs, and leisure-time outcomes. These findings provide insight into the specific teacher behaviours that students identify as relatedness-supportive, and reinforce the potential implications these behaviours might have for students’ experiences in PE.
Introduction

Despite the acute and long-term benefits of physical activity participation, a large proportion of young people lead insufficiently active lifestyles. With this in mind, school-based physical education (PE) is recognised as an important context for the promotion of physical activity among children and adolescents (Standage et al., 2005). Indeed, engagement in PE not only has the potential to contribute directly to physical activity participation for young people, researchers have also demonstrated a link between more positive experiences in PE and higher levels of in-class and leisure-time physical activity engagement (e.g., Cox, Smith, & Williams, 2008; Hagger et al., 2009).

In seeking to understand the ways in which students’ in-class perceptions and experiences are shaped, much of the educational psychology literature – both within and beyond PE – has focused on the role of the teacher in determining motivational dynamics within the classroom (see Furrer & Skinner, 2003; Koka & Hagger, 2010). As a result, the importance of social and interpersonal factors in shaping children’s motivation is well established (Deci & Ryan, 1985). In classroom-based (i.e., non-PE) settings, close, supportive relationships with teachers have been shown to support better student engagement and academic achievement (Furrer & Skinner, 2003). Over the last decade, studies within PE have also demonstrated that students’ perceptions of teacher support (e.g., Cox & Ullrich-French, 2010; Taylor & Lonsdale, 2010), encouragement (e.g., Wang, Chatzisarantis, Spray, & Biddle, 2002), and motivational climate (e.g., Cox & Williams, 2008) are related to more favourable attitudes, motivation, and behaviours in PE. Although PE teachers have the potential to motivate and encourage children and youth to be physically active, there is still much to learn about the role that PE teachers play in providing their students with quality experiences that promote optimal learning.
environments (i.e., those that stimulate motivation and engagement). One theoretical framework that addresses both the individual and social factors that elicit different types of motivation is Self-Determination Theory (SDT; Deci & Ryan, 1985), and it is this conceptual model upon which the present study is grounded.

**SDT and PE**

SDT is a theory of motivation, in which it is proposed that humans are actively driven by inherent tendencies for psychological growth and fulfillment, and may experience substantively different types of motivation within a given context. Accordingly, much of the work conducted within the bounds of SDT has been directed toward exploring the social processes and perceptions that support high-quality motivational responses (e.g., autonomous motivation). Within SDT, individuals are described as being *autonomously motivated* when their participation in a given activity is based on their own volition (e.g., for the fun, interest, enjoyment, and/or valued outcomes that the activity provides).

According to SDT, autonomous motivation is catalysed by the fulfillment of three basic psychological needs: autonomy (i.e., a sense of choice and volition), competence (i.e., feeling capable in one’s pursuits) and relatedness (i.e., feeling valued/supported by, and connected to, significant others). The theory posits that individuals’ basic psychological needs can be satisfied when important others engage in behaviours that are designed to support one’s need satisfaction. These behaviours are termed autonomy support, interpersonal involvement (i.e., relatedness support), and structure (i.e., competence support). Subsequently, ‘need supportive’ environments that satisfy or fulfill these needs provide an important environmental scaffold through which individuals experience need satisfaction, and thus, endorse relatively more self-determined forms of motivation (Deci & Ryan, 2000). Perceptions of highly autonomy-, competence-, and relatedness-supportive
environments, therefore, are theorised to indirectly support various desirable outcomes (e.g., engagement, autonomous motivation), via their positive relations with need satisfaction and autonomous forms of motivation. Consistent with this notion, a number of studies have shown that when students perceive their PE teacher to be more need supportive (e.g., Taylor & Ntoumanis, 2007; Tessier, Sarrazin, & Ntoumanis, 2010), they report greater need satisfaction, more autonomous forms of motivation in PE, and also exhibit more positive affect, less negative affect, higher concentration, and greater effort in class (Chatzisarantis & Hagger, 2009; Standage et al., 2005).

With these proposed relationships in mind, SDT researchers have focused their attention in part on the social factors most likely to satisfy or thwart people’s needs. Within PE settings, the majority of this line of SDT-related research has examined the extent to which students perceive their PE teachers to be autonomy-supportive (i.e., PE environments that support choice, initiation, and understanding; Reeve & Jang, 2006) and provide structure (i.e., clarity in information, communicate clear expectations and how to achieve desirable outcomes; Jang, Reeve, & Deci, 2010). In contrast, less work has been directed toward the degree of relatedness support provided by PE teachers, and the extent to which specific teacher behaviours satisfy students’ feelings of relatedness. Given that interpersonally-involving climates/behaviours are perhaps the least well understood of the three needs within PE, and the central role of one’s teacher in shaping one’s PE experiences, it is important to explore aspects of the social environment (i.e., specific teacher behaviours) that foster a sense of relatedness so as to broaden our understanding of need support in PE (Standage & Emm, 2014).
Sense of Relatedness

The need for relatedness refers to a sense of connection to, and experiencing close, caring and mutually supportive relationships with, significant others (Baumeister & Leary, 1995). According to SDT, all humans have a basic psychological need to feel accepted and trusted by, and meaningfully related to others (Deci & Ryan, 2000). Indeed, the experience of nurturing, stable, and safe relationships with other people is proposed to foster the adoption and internalisation of goals and values (Baumeister & Leary, 1995), as well as enhanced psychological wellness (Deci & Ryan, 2014). According to Furrer and Skinner (2003), relatedness is also a particularly important predictor of children’s engagement and learning in the classroom. Furrer and Skinner hypothesised that feeling important to key caregivers (e.g., teachers) can “trigger energised behaviour, such as effort, persistence, and participation; promote positive emotions, such as interest and enthusiasm; and dampen negative emotions, such as anxiety and boredom” (p. 149). In classroom-based (i.e., non-PE) school contexts, there is a large body of evidence indicating that student-teacher relationships characterised by high levels of warmth and support (i.e., relatedness) are positively associated with student engagement, self-efficacy (i.e., one’s confidence in one’s ability; Bandura, 1997), effort, positive affect, and achievement (Furrer & Skinner, 2003; Wentzel, 1997, 1999).

Similar to traditional classroom settings, the interpersonal style of PE teachers has been shown to be positively associated with students’ motivation, engagement and experiences in PE (Standage et al., 2007). As previously noted, ample focus in the classroom has been given to teacher behaviours that support or thwart feelings of autonomy or competence. Classroom-based work has investigated specific autonomy-supportive instructional interactions that support students’ autonomous motivation (Reeve, 2006), as
well as specific teacher behaviours that promote the provision of structure within the classroom (Jang, Reeve, & Deci, 2010). Within the context of PE, results from studies have demonstrated the importance of giving choice, autonomy support, and providing a mastery climate to students’ feelings of autonomy, competence, and relatedness in PE (Cox & Williams, 2008; Standage et al., 2003; 2006).

In terms of relatedness support, less attention has been directed toward identifying the specific interpersonally-involving teacher behaviours that support students’ relatedness in PE, and study of the social factors associated with students’ perceptions of relatedness has been limited to teachers’ emphasis on cooperation (Ntoumanis, 2001) and provision of autonomy support (see Standage, Gillison & Treasure, 2007), as well as their emotional support and promotion of a mastery climate (Cox & Williams, 2008). Work by both Cox and Williams (2008) and Standage et al. (2003) showed that students’ perceptions of relatedness support in PE were a stronger predictor of self-determined motivation than were perceptions of autonomy and competence support. Although this work exemplifies the importance of interpersonally-involving climates within PE, relatedness is often not the target of needs-focused work in this context, and the specific ‘supports’ (i.e., techniques or behaviours) that serve to satisfy students’ feelings of relatedness in PE settings are not fully understood. Perhaps in light of the notion that relatedness support serves primarily as an internalising agent but alone is not sufficient to ensure quality relational bonds (Standage & Emm, 2014), similar to other SDT-related work, the majority of research conducted within PE settings has focused on the degree to which students perceive their teacher to be autonomy or competence supportive. Accordingly, there are two noteworthy reasons that support the investigation of students’ perceptions regarding teachers’ relatedness-supportive behaviours. First, such investigation promises to provide novel conceptual
insight into the characteristics of relatedness-supportive, or interpersonally-involving, teaching in PE. Second, the findings from such work may uncover important practical strategies regarding the instructional styles (i.e., teacher behaviours) that assist in optimising students’ relational perceptions and experiences in PE.

Using a realist perspective (Kinnafick, Thøgersen-Ntoumani, & Duda, 2014; Sobh & Perry, 2006), the primary purpose of this study was to explore, through semi-structured group interviews, the specific teacher behaviours that students perceive to be relatedness supportive in PE. The realism paradigm considers the external realities of different contexts but acknowledges that the complexities of certain situations needs to be investigated through qualitative methods (Sobh & Perry, 2006). That is, a realist approach recognises the importance of meaning, with a focus on the interpretive nature and explanatory significance of the context in question, and does so without reducing the context to a set of “extraneous variables” (Maxwell, 2004). Using SDT as the guiding theoretical framework, this approach was used to understand and make sense of students’ experiences with their PE teacher, and to focus on the underlying structures and mechanisms that occur within this context. With this in mind, the first aim of the study was to explore students’ social interactions with their teachers, with a particular emphasis on uncovering the things their PE teacher does that they infer as being relatedness-supportive. In addition to exploring these instructional behaviours that support students’ relatedness needs, we also aimed to examine the relevant implications of relatedness-supportive environments within the context of PE. As SDT proposes, environments that are supportive of one’s relatedness needs should promote greater satisfaction of that need (Deci & Ryan, 1985), and subsequently facilitate various positive outcomes (e.g., autonomous motivation). In line with the notion that favourable perceptions of relatedness support might accompany
various desirable outcomes, the second aim of this study was to examine and obtain insight into relevant outcomes that students described as stemming from their perceptions of teacher-derived relatedness support in PE.

Method

Participants

Participants were 48 male and female high school PE students (males = 24, females = 24, $M_{age} = 13.54$, $SD = 0.58$) from three independent schools within the Perth metropolitan area, representing one all-girls school (female teacher), one all-boys school (male teacher), and one co-ed school (one all-girls class, female teacher; one all-boys class, male teacher) who answered interview questions and were probed regarding their current PE teachers (although discussions around past experiences did occur). All participants took part in weekly compulsory PE, which was delivered across two or three class periods lasting 50 minutes. To protect participant anonymity, where meaning units are presented in the results, all names and identifying information of students, teachers, and schools have been changed or removed.

Procedures

After obtaining permission to conduct the study from the Human Research Ethics Board at the lead authors’ institution, recruitment letters were distributed to principals at several independent high schools. Potential participants were informed that (a) participation was voluntary, (b) anonymity of all students, teachers, and schools was ensured, and (c) any party could withdraw from the interview/study at any time. After obtaining principal, teacher, and student informed consent, group interviews (3-4 students) were arranged through discussion with PE teachers at each school and purposeful sampling was used (i.e., convenience sampling). All interviews were conducted on-site at each of the
three schools and were audio-recorded to allow for subsequent transcription. Upon completion of the interviews, all participants were given the opportunity to ask questions about the nature of the investigation and a student de-brief and parent information sheet was sent home with each student participant. The parent information sheet contained all information about the study and a stamped addressed envelope for parents/guardians to sign if they wished to withdraw their son/daughter from the study. This passive consent process (i.e., parents return a letter if they wish to withdraw their son’s/daughter’s participation) was approved by the institutional review board given the confidential, non-invasive nature of the project, and the maturity/comprehension level of intended participants (National Health and Medical Research Council, 2007).

**Interview Guide**

The lead author conducted the majority of the interviews and where scheduling issues arose, interviews were conducted by co-authors with prior experience facilitating semi-structured interviews within school PE contexts. Before data collection, guidelines from key qualitative texts were reviewed (Braun & Clarke, 2006; Sobh & Perry, 2006) and the interview guide was peer-reviewed by researchers in sport/exercise psychology to assess interview breadth and depth, as well as to highlight any problematic questions. The final semi-structured interview guide consisted of seven open-ended questions with sub-questions (see Appendix A) designed to tap into various aspects of relatedness support as defined within the SDT literature (Deci & Ryan, 1985). To orient participants to discuss their experiences of the focal construct (i.e., relatedness support), students were given a handout prior to the start of the interview, and a discussion took place during which the interviewer introduced the concept of relatedness support along with some guiding terms identified by the existing literature (e.g., caring, warmth, support, understanding; Deci &
The questions asked were framed to (1) investigate identifiable teacher behaviours apparent inside and outside the PE classroom (i.e., on school grounds, in the halls) that students identify as indicators of relatedness support (e.g., “What sorts of actions or behaviours does your PE teacher demonstrate that make you feel relatedness supported in PE?”), and, (2) outcomes of students’ perceived relatedness support within their PE class (e.g., “If any, what impact does/did this [teacher behaviour] have on you in your PE class?”). Where appropriate, probing and clarification cues were employed to ensure that the researchers did not “take for granted common sense assumptions and understandings” (Bogdan & Taylor, 1984, p. 96). At the end of the interview, students were invited to (a) ask any questions about the study, (b) supplement any information not covered by the questions, and (c) provide feedback regarding the interview. Interviews lasted for 30 min, on average.

**Data Analysis and Trustworthiness**

After interviews were transcribed verbatim, data were analyzed by the first author whereby meaning units that shared a common conceptual focus were sorted into themes related to either behavioural indicators of relatedness support or putative outcomes of relatedness-supportive instruction. The approach used was abductive in nature (see Taylor, Ntoumanis, & Smith, 2009). The abductive approach is grounded in the notion that most research advances are neither purely inductive nor deductive in nature. Thus, adopting an abductive approach takes into consideration prior knowledge (e.g., theory), while also allowing for new interpretations about existing phenomena (real-life observations) to emerge, enabling researchers to arrive at new conclusions (Kovács & Spens, 2005). We set out purposely to interpret and make meaning of the data through the lens of SDT, but were also open to the emergence of unanticipated phenomena and themes unrelated/challenging.
to SDT. Similar to previous work (Taylor et al., 2009), our analytical process involved constant dialect between everyday meanings and theory so that meaning units consistent with the underlying framework could be coded in line with SDT principles (Deci & Ryan, 1985), while also allowing for themes to emerge that were not outlined within SDT (Braun & Clarke, 2006). Meaning units represent a phrase, sentence, or paragraph containing one conceptually relevant piece of information (Tesch, 1990). After listening to recordings and reading through the transcribed text multiple times, the first author noted clusters of meaning units mentioned more than once, which acted as the initial processing of the information and theme development (Braun & Clarke, 2006). Themes were created based on instances where meaning units shared a consistent conceptual focus, and were identified to provide an overall representation of the prominent recurring issues discussed by the students. Before final assignment of the meaning units, discussions were held between co-authors regarding theme names and definitions, with the aim of creating conceptually relevant and independent themes, and in order to avoid thematic overlap. Software-based content analyses using the QSR NVIVO program was employed to group meaning units into themes for both indicators and outcomes (Berg, 2007).

Data collection was terminated at the point of saturation, representing the time at which no additional themes emerged from the data (Miles & Huberman, 1990). The point of saturation was determined when no new emergent issues were being recorded by the first author during the interview process. Such an approach is consistent with recommendations by Miles and Huberman (1994) that researchers identify recurrent themes and “lay aside the more tenuous ones until other informants and observations give them better empirical grounding” (p. 70). Analyses confirmed the point of saturation; that is, when analysing the last two transcripts from the student group interviews, it was apparent that all emergent
meaning units were consistent with existing themes, and no novel themes were formed during examination of these transcripts.

After transcribing the data, the first author read and reread the interviews to gain a general sense of their content, and to begin reflecting on their collective meaning (Creswell, 2003, 2009). General thoughts about the data were recorded in the margins and a coding process began by organising the content into chunks and labeling them with a ‘common term’ (i.e., participants’ actual language; see Ferguson, Kowalski, Mack, Wilson, & Crocker, 2012). To ensure consistency, emergent themes were compared to the original transcripts, and the first author reread all transcripts to ensure the text reflected the themes. At this point in the analysis, a process of peer debriefing occurred between the first and last author to discuss theme definitions, credibility, and interpretation, and the last author examined, coded, and provided rigorous feedback regarding the established meaning units and themes, as well as the initial conclusions made by the first author (Creswell, 2003). Following peer debriefing, the first author deleted problematic meaning units, merged common/redundant themes and recoded meaning units based on the last author’s feedback.

With the aim of ensuring trustworthiness of analyses, a process of peer review was subsequently employed (Jones & Ogilvie, 2012) whereby a group of co-authors (i.e., the second and third author) independently examined and coded all meaning units from the 11 group interviews according to the identified themes. Specifically, the co-authors were provided with a list of all meaning units along with the theme names (including definitions) that had been developed by the lead investigator at the initial analysis stage. To complete the review of meaning units, co-authors were asked to independently assign each meaning unit to any theme, and if problematic issues arose (e.g., the assignment of meaning units to the same theme, disagreement about the content/relevance of meaning unit) these were
identified for subsequent discussion. This process was conducted for both the behavioural indicators of relatedness support and outcomes of relatedness-supportive behaviours, and an average inter-rater reliability (in terms of assignment to a given theme) of 80% for the behavioural indicators, and 75% for the outcomes was found across the four coders (i.e., including the lead author’s original coding). Subsequently, in instances of disagreement, consensus was achieved through a three-step process (Berg, 2007). This involved continuous debate between investigators regarding (a) the names and definitions of themes, (b) inter-theme distinctiveness, and (c) intra-theme similarity. As a result, some themes were collapsed together to form a single group of meaning units, and in other cases themes that reflected more than one concept were subdivided to more accurately reflect students’ responses. At the end of the review process, consensus between all researchers was achieved on all meaning units and themes for both indicators and outcomes.

Results

In total, the 11 group interviews produced 85 pages of 12-point, single-spaced, transcribed text resulting in the identification of 201 and 183 meaning units for indicators and outcomes of relatedness support, respectively. Emergent themes were grouped into one of two broad categories that reflected the aims of the investigation. That is, themes were classified as either behavioural indicators of relatedness support (see Table 2.1) or outcomes of relatedness supportive instruction (see Table 2.2). In Table 2.1, higher-order categories are listed, and in both tables 2.1 and 2.2, all themes are displayed with accompanying definitions, exemplar meaning units, and frequency counts for the purpose of providing insight into the more commonly occurring themes highlighted by students (Mays & Pope, 1995). These frequency counts are simply for illustrative purposes, and are not intended to represent markers of the relative ‘importance’ of themes.
**Behavioural Indicators of Relatedness Support**

Three distinct higher-order categories emerged containing themes that students perceived to be teacher behaviours relatedness supportive in nature. These behavioural indicators broadly reflected students’ perceptions regarding (i) teacher communication (e.g., individualised conversation), (ii) in-class social support (e.g., task-related support), and (iii) behaviours associated with teacher attentiveness (e.g., awareness). A more detailed description of each higher-order category – along with lower-order themes and relevant meaning unit examples to supplement those presented in Table 2.1 – is presented below. A coding system was put in place following each meaning unit presented to identify the gender of the student (e.g., M = male) and school context (e.g., coed).
Table 2.1. *Themes, Definitions and Exemplar Meaning Units for Behavioural Indicators of Relatedness Support*

<table>
<thead>
<tr>
<th>Higher-Order Category</th>
<th>Lower-Order Theme</th>
<th>Definition</th>
<th>Exemplar Meaning Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teacher Communication</strong></td>
<td>Individualised Conversation (34)</td>
<td>Direct commentary provided by the teacher that is individualised and unique to that student; showing a deeper understanding and apparent interest in the student outside of the task at hand.</td>
<td>“sometimes they might ask you where you’re from so they could find out what kind of sports you might like” (M, all-boys)</td>
</tr>
<tr>
<td>Teacher Enthusiasm (25)</td>
<td>Markers of teacher motivation (or lack of motivation).</td>
<td></td>
<td>“[the teacher] is so happy and energetic all the time, always optimistic and has such a bubbly personality” (F, all-girls)</td>
</tr>
<tr>
<td>Friendly General Communication (35)</td>
<td>General verbal and non-verbal communication with that teacher that students’ perceive to be friendly and approachable in nature.</td>
<td></td>
<td>“how [the teacher] reacts and stuff, she’ll make herself seem approachable, not scary or stuff, she is very friendly” (F, coed)</td>
</tr>
<tr>
<td><strong>In-class Social Support</strong></td>
<td>Task-related Support (34)</td>
<td>Things that the teacher does during class that makes students feel more supported and are task-focused in nature.</td>
<td>“giving you a compliment when you’re doing well in sport. Pointing out your strengths and weaknesses” (M, all-boys)</td>
</tr>
<tr>
<td>Promoting Cooperation and Teamwork (12)</td>
<td>Students’ perceptions of the way in which teachers encourage/facilitate cooperation and student interactions.</td>
<td></td>
<td>“[the teacher] will set an achievement and you have to get to it. The whole class. So you have to get it as a team sort of thing” (M, coed)</td>
</tr>
<tr>
<td><strong>Teacher Attentiveness</strong></td>
<td>Awareness (19)</td>
<td>Teacher demonstrating the ability to perceive, notice, be conscious of class events or recognise things that are not overly apparent in their classroom.</td>
<td>“[the teacher] is aware the we all have different skill levels, so she tailors it to all sorts of levels because some of us are not as good as others” (F, coed)</td>
</tr>
<tr>
<td>Caring Behaviours (42)</td>
<td>Teacher responding to class events in a way that demonstrates a level of caring or that the teacher is concerned with the students’ well-being.</td>
<td></td>
<td>“[the teacher] never makes you feel like it was a silly question. She always respects the fact that we might not understand” (F, all-girls)</td>
</tr>
</tbody>
</table>

*Note.* In the first column, the number in parentheses represent frequency counts. For example, 34 meaning units were classified as Individualised Conversation.
**Teacher communication.** Sources that were coded under this higher-order category were grouped into three distinct themes. First, students’ perceptions of *individualised conversation* were characterised by specific commentary provided by the teacher that was individual or unique. Meaning units reflected students’ perceptions that their teacher showed a deeper understanding or apparent interest in them outside of the activities and instruction that are part of regular PE (i.e., class time), and also demonstrated some knowledge about an individual student’s circumstances (e.g., preferences, background, interests). For example, one student (M, all-boys) highlighted that the teacher “kind of treats you like a friend, and really makes an effort to connect with you, like, “how are you going with sport?”” In another instance, a student (F, all-girls) commented, “[the teacher] will ask us about what we did on the weekend, and then we can explain what we did and ask her stuff, and then you can kind of relate.”

Meaning units reflecting the teacher communicating to their students that s/he seemed to enjoy and be interested in teaching (e.g., markers of teacher motivation/lack of motivation) were categorised under the theme, *teacher enthusiasm*. Students believed their teacher to be more relatedness-supportive when s/he was generally happy, energetic, enthusiastic, and “bubbly” (F, all-girls). For example, one student (F, coed) highlighted that “[the teacher] always seems happy to be a PE teacher. Because I have teachers in other classes that, they just seem like they don’t want to be there. But she seems to be the type of teacher that she’s happy she’s there, and she’s happy that she’s teaching”, while on the other hand, another student (F, coed) noted that “the teacher isn’t interested in what we are feeling about the activities we are doing”. Another student (F, all-girls) noted that they believed their teacher was relatedness-supportive because their teacher was “so happy and energetic all the time, always optimistic, and she has a bubbly personality”.
The final, and most frequently cited theme (Table 2.1) that students’ inferred to be relatedness-supportive in this category, related to their teachers’ *general friendly communication*. Meaning units in this category reflected students’ perceptions towards general verbal and non-verbal communication with the teacher that was friendly and approachable in nature; highlights included general supportive commentary between students and teacher that was non-specific in nature, as well as making jokes or “having a laugh” (M, all-boys) with the students, and the teacher’s “body language” (F, all-girls). For example, students perceived that their teacher was being relatedness-supportive because “she’ll [my teacher will] have a joke with us” (F, coed) or “[my teacher] comes and says hello to you if he sees you around the school and stuff” (M, all-boys). In contrast to instructional behaviours that promote relatedness support, one student (M, coed) made comment that “if the teacher was being mean or something, he would be spreading around that kind of negative energy”. Notably, students highlighted that a relatedness-supportive teacher demonstrated specific “body language”. For instance, one student described “body language. Can you say that? Like how she reacts to stuff, she’ll make herself seem approachable, not like really scary or stuff” (F, all-girls), as one characteristic of her teacher whom she considered to demonstrate relatedness-supportive behaviours.

**In-class social support.** The first behavioural indictor of relatedness support, and most frequently cited in this category (Table 2.1), reflected the role of specific *task-related support* provided by the teacher. Meaning units in this theme reflected teacher behaviours that were task-focused in nature and included students’ perceptions that their teacher supported them in helping them to understand class content better, offered support that was informative, and helped students to improve by giving positive feedback, verbal praise (e.g., compliments) and “positive talk”, for example “keep on going!” (M, all-boys) or “you
can do it!” (F, all-girls). For example, one participant (M, all-boys) pointed out that he felt that his teacher was being relatedness-supportive when he went out of his way to “say good job, or congrats, when you do something good”. Another student (M, all-boys) described an experience with a past PE teacher which highlighted an example of inadequate task-related support provided by the teacher: “every sport, he would just give us, he wouldn’t explain what it all means, he wouldn’t get involved or talk to you or anything. He would just give the whole group instruction and kind of leave us”.

The second (and only other) theme to emerge in this category was indicative of the teacher’s encouragement and facilitation of cooperation, teamwork, and student (i.e., peer-to-peer) interactions within class. In this theme, it was evident that students believed that their teacher was being relatedness-supportive when s/he provided opportunities for students to work together and be “more of a team” (F, coed). For instance, to promote cooperation in class one student (F, all-girls) made comment that “[my teacher] always allows for discussion, and we can talk to our friends and stuff”. Another student (M, all-boys) noted that “sometimes [the teacher] goes out of his way and pairs you up with someone you might not know as well, so you just don’t get paired with your friends, he tries for you to get to know everyone better”. Regarding the encouragement of teamwork and working together within class, one student (M, all-boys) noted that “[the teacher] creates an atmosphere of more of a team rather than all of the kids competing against each other. It’s more all of the kids helping each other”. Another student (M, coed) made comment that the teacher will “set an achievement and you have to get to it, the whole class, so you have to get it as a team sort of thing”.

**Teacher Attentiveness.** In the first theme, awareness, students identified that when their teacher demonstrated the ability to perceive, notice, or recognise class events,
they felt that s/he was being relatedness-supportive. This level of awareness was characterised by the teacher being clearly conscious of things going on during class time, for example, picking up on the emotional cues of students or demonstrating an awareness of student ability. One student (F, coed) commented, for instance, “I think from the beginning the teacher tried to understand our friendship groups”. In another example, one student (F, coed) highlighted that “this particular teacher accepts it when I just can’t do something. Like, most teachers make you keep trying, keep trying, and I’m not good at sports, and she gets it, that I have hit a wall and I just can’t do it”. Finally, to highlight that the teacher demonstrated awareness, one student (F, all-girls) noted that “[the teacher] is aware that we have different skill levels, because she knows some of us are not as good as others”. Some students also highlighted the lack of awareness apparent within their class. One student (M, all-boys) noted, for example, that “…last year I didn’t enjoy PE. I struggled a bit because the teacher didn’t notice a lot of people in the class, and it was always the better person that everybody knows sort of thing.”

The second and final theme, as well as the most frequently documented behavioural indicator of relatedness support in this category, *caring behaviours*, reflected students’ perceptions of their teacher responding to class (or personal) events in a way that demonstrated a level of caring, or that showed that the teacher is/was concerned with student well-being. Meaning units in this theme reflected the teacher responding to problems or issues in-class and attempting to fix them, being accepting and understanding, valuing the students for who they are, and treating students like an equal. For example, one student (F, all-girls) made comment that “if [my teacher] sees people sad and or not participating, she’ll ask what’s wrong”. Another example highlighted that if “someone is having a bad day, like if they are distracted or if they are not as involved as usual, [the
teacher] will notice them and ask if they want to sit out, like what’s wrong with them and if they want to say, and if there is anything she can do” (F, coed). Students also highlighted they felt relatedness-supported when their teacher showed respect by treating students like an equal. For example, one student (F, all-girls) made comment that asking questions was easy in class because “She never makes you feel like you are asking a silly question. She always respects the fact that we may not understand”. It is important to note that in most cases this theme related directly to a teacher’s response to a particular event and was often described consecutively with the teacher demonstrating awareness (e.g., if the teacher was aware of something, the participants often went on to describe a caring response to that situation).

Outcomes of Relatedness-supportive Instruction

Five distinct themes emerged with respect to outcomes of relatedness-supportive instruction. As a result of students feeling relatedness supported, students reported outcomes related to (a) experiences of affective responses and mood states, (b) class engagement, (c) intrinsic motivation, (d) efficacy beliefs and, (e) various leisure-time outcomes. Affective responses and mood states was most frequently cited (see Table 2.2 below).
<table>
<thead>
<tr>
<th>Theme</th>
<th>Definition</th>
<th>Exemplar Meaning Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affective Responses and Mood States (65)</td>
<td>Reference to feeling comfortable, connected and supported by their PE teacher as well as feeling emotional states which have come as a result of perceiving their teacher to be relatedness-supportive.</td>
<td>“[feeling relatedness support from the teacher] it would effect what you think at the start of the day when you see you have PE, it would effect your general mood really” (M, all-boys)</td>
</tr>
<tr>
<td>Behavioural Engagement (57)</td>
<td>Reference to investment, involvement, motivation or application of energy in one’s class, peers or teacher as well as the willingness and desire to participate and be successful in PE.</td>
<td>“you wouldn’t work as well. You won’t really know what’s going on, if they don’t notice you or your not close to them, that won’t help you in any way” (F, coed)</td>
</tr>
<tr>
<td>Intrinsic Motivation (31)</td>
<td>Specific reference to motivation that is based on taking pleasure in an activity (i.e., intrinsic factors) characterised by feelings of enjoyment, fun, and interest.</td>
<td>“and even if you’re not the sportiest person, she’ll make you enjoy it, you’ll have fun with it. She makes it more enjoyable” (F, all-girls)</td>
</tr>
<tr>
<td>Efficacy Beliefs (17)</td>
<td>Reference to students’ confidence or belief in their own (i.e., self-efficacy) ability, whether in a general sense or specifically in their PE class as a result of their teacher being relatedness-supportive.</td>
<td>“with my old teacher, if you were really good at swimming, he’d put you in the good lane, and it made you feel good about yourself” (M, coed)</td>
</tr>
<tr>
<td>Leisure-time Outcomes (13)</td>
<td>Intentions to try new physical activities or continue existing forms of physical activity based on their teacher being relatedness-supportive.</td>
<td>“if it’s one of these sports and you kind of have a bad experience [because of the teacher], then you might be off of it for the rest of your life” (M, coed)</td>
</tr>
</tbody>
</table>

*Note. In the first column, the number in parentheses represent frequency counts. For example, 65 meaning units were classified as Affective Responses and Mood States.*
Affective responses and mood states. The first and most cited theme reflected students’ positive or negative feelings and mood states that came about as a result of their teacher’s relatedness-supportive behaviours. Meaning units highlighted feeling comfortable and connected to their PE teacher, feeling supported, and feeling like they could trust their teacher, as well as specific mood states such as feeling happy, at ease, relaxed, or, in cases where a lack of relatedness support was described, stressed, and being in a bad mood in class. For example, one student (M, all-boys) emphasised that if they did not feel relatedness support from their teacher “it would feel a lot less friendly, it wouldn’t be a friendly environment”, while another student (M, all-boys) mentioned “the class would not be as relaxed”. Another student (F, coed) highlighted the importance of relatedness support, noting that “it makes us feel like we can trust her and talk to her about stuff if we need to”. One student (F, coed) also made comment that “you would feel less stressed [if you had a relatedness-supportive teacher]. If you don’t have a teacher like that, and you’re doing something hard, then you would feel stressed about it”.

Behavioural engagement. This theme reflected students’ level of application in, or amount of energy put into, their PE class (i.e., effort), as well as general feelings of motivation as a result of relatedness-supportive instruction. Meaning units included students’ general reference to investment, involvement, and motivation in class, or towards their peers and teacher, as well as their willingness and desire to participate and be successful in their PE class. For instance, one student (F, coed) highlighted that teacher relatedness support was important because it “makes the students want to try, and they don’t feel like they have to do it, or they don’t want to do this and they don’t want to be here. They want to do it and be there”. In another instance, one student (M, coed) made a comment that “it’s easier to ask for help [from the teacher], and other stuff like that”, when
their teacher provided them with relatedness support, while another student (M, all-boys) noted that it impacted upon “how hard you try in the subject”. In contrast, students also identified that if their PE teacher was not providing adequate relatedness support, they felt less inclined to participate in class. For instance, one student (M, coed) noted that “if the teacher wasn’t [was not relatedness-supportive], no one would want to be doing much of anything”.

**Intrinsic motivation.** Students also specifically identified high levels of intrinsic motivation as an outcome associated with relatedness-supportive teaching. Meaning units in this theme referred to motivation that was based on taking pleasure and interest in their activities (i.e., intrinsic factors) as a result of feeling relatedness support from their teacher. Meaning units in this theme were characterised by students’ specific reference to enjoyment, fun, or interest in their PE class. For example, one student (F, all-girls) emphasised that having a relatedness-supportive teacher is important because “she makes it so fun. It’s like I want to go because I know I am going to learn stuff in a more enjoyable way”. Another student (F, coed) noted that feeling relatedness support from the teacher “makes sport fun. You enjoy it more and you enjoy sport”.

**Efficacy beliefs.** A number of meaning units also showed that students reported greater confidence in their abilities as a result of their teacher demonstrating relatedness-supportive behaviours. For instance, when questioned as to whether having a relatedness-supportive teacher was important in PE class, one student (F, coed) noted that, “you might think you’re good at [PE] because the teacher is the one who influences everything”, and another student (M, coed) highlighted that relatedness-supportive teachers “build up people’s self-confidence”.

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**Leisure-time outcomes.** The final outcome theme reflected students’ intentions to try new physical activities, continue existing recreational activities, or harbour positive attitudes towards physical activity based on their teacher being relatedness-supportive. Meaning units in this theme highlighted out-of-school outcomes or favourable attitudes towards physical activity based on their (relatedness-supportive) experiences within PE class. This theme was illustrated by one student (M, all-boys), who mentioned, “in your average PE class, that’s where you start most of the sports, and where you find out which ones you like and potentially ones that you want to do outside of school, and so if your teacher doesn’t [provide you with relatedness support] you may not continue it out of school or on the school team”. In terms of positive attitudes, one student (F, coed) mentioned that feeling relatedness support from the PE teacher was important because “it can leave you with a good impression. So when you go outside of school, you want to do it.”

**Discussion**

This investigation was conducted to explore the specific PE teacher behaviours that students perceive to be relatedness-supportive, and also to document the possible outcomes associated with having a warm, caring, nurturing, and supportive relationship with one’s PE teacher. Standage and Emm (2014) recently contended that key social agents, like teachers, who play a role in shaping students’ attitudes and values towards sport and physical activity, would ideally seek to engage in close, caring, warm, and respectful interactions with their pupils and suggest that more work is needed to identify specific techniques and behaviours targeting relatedness. Due to the nature of PE (and the broader school environment), there are frequent and varied opportunities for teachers to interact with students. Importantly, the quality of such interactions has the ability to shape students’
experiences in PE, and may be directly or indirectly associated with students’ motivation to participate in physical activity (Jackson et al., 2013). To date, there has been considerable focus on competence and autonomy need-supportive environments within the PE context, and less attention has been directed toward identifying the full range of relatedness-supportive (i.e., interpersonally-involving) teacher behaviours that students perceive to be facilitative (Van den Berghe et al., 2014). The results of this study provide important practical information regarding pedagogy and SDT (Deci & Ryan, 1985), insofar as they offer insight into the specific teacher behaviours that students perceive to be relatedness-supportive, and highlight potential need-supportive practices for promoting relatedness-supportive instruction in PE.

As this research was exploratory in nature, the first aim of this study was to identify specific instructional behaviours performed by the PE teacher that students deemed to be relatedness-supportive. Analyses identified three higher-order categories that reflected students’ perceptions regarding their teacher’s communication, in-class social support provided by the teacher, and teacher attentiveness. More specifically, students reported that feelings of relatedness support stemmed from PE teacher behaviours such as individualised conversation, teacher enthusiasm, friendly general communication, task-related support, promoting cooperation and teamwork, awareness, and caring behaviours. Considering the social context of the PE classroom – where interaction with the teacher can be frequent and students are required to engage in overt, public behaviour – the emergent themes identified by students reflect a unique set of interpersonally-involving instructional practices. Overall, themes were characteristic of teachers who demonstrate caring and thoughtful behaviours in class and seek to build friendly, mutually respective relationships with their students. Interestingly, in addition to the various in-class interactions that students
identified as relatedness-supportive, the methodology used in this study also enabled students to describe how relatedness support might be provided partly through out-of-class interactions with their PE teacher (e.g., through general discussions held around the school outside of class).

Interestingly, students identified some instructional practices that displayed a consistent focus on their teacher giving them friendly, individual attention. Specifically, individualised conversation and general friendly communication reflected students’ perceptions of their teacher “getting to know them better” as an individual, and conversing with them in a friendly way. These results are interesting as they indicate that students are aware of the effort their teacher displays (towards them as an individual), and that the individual attention provided to them may influence their affective responses, motivation, and engagement in class. Additionally, individualised conversation and general friendly communication also seemed to underscore the importance of teacher-student rapport. Frisby and Martin (2010) defined rapport “… as an overall feeling between two people encompassing a mutual, trusting, and prosocial bond” (p.147), and in general education, students have reported rapport to be an essential attribute of an effective teacher (Catt, Miller, & Schallenkamp, 2007). In this study, individualised conversation and general friendly communication appeared to closely reflect this teacher characteristic, and the various student outcomes associated with a relatedness-supportive teacher demonstrate the potential ability for these practices to shape positive student outcomes within and beyond the classroom. Gremler and Gwinner (2000) contended that rapport is operationalised using two dimensions, namely a personal connection and an enjoyable interaction, and the findings from this study appear to substantiate this conclusion. By engaging in commentary with students that is individualised and unique, as well as friendly and
approachable in nature, this appears to be an effective method that enables teachers to provide relatedness-supportive (and rapport-building) interactions. That said, it is likely important to caution that teachers should be advised to provide individualised conversation (a) alongside other relatedness support indicators discussed below, and (b) in an authentic manner, in order to avoid the potential for students to perceive such behaviour as intrusive.

Students also identified both ‘task-related support’ and ‘promoting cooperation and teamwork’ as instructional practices that foster relatedness support within their PE class. Interestingly, past work has reported these behaviours to be reflective of autonomy and competence need support (Ommundsen & Kvalø, 2007), demonstrating potential overlap in SDT constructs. However, SDT highlights that under optimal conditions there are positive interrelations among the three basic needs (Deci & Ryan, 2014). Given that correlations between the three basic needs can be strongly positive in nature, it is entirely possible that students identify certain teacher behaviours as relatedness-supportive, whilst also endorsing that behaviour as being autonomy- and/or competence-supporting (Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008a; Ommundsen & Kvalø, 2007).

Of particular relevance to this study, the indicators of relatedness support identified by students offer novel conceptual advancements in terms of our understanding of instructional practices that contribute to relatedness support in this context and provide additional insight into how relatedness support might be operationalised in PE. For example, in contrast to the way in which relatedness support is often operationalised in this context (see Standage et al., 2005), results from this study provide a more detailed insight into the indicators of relatedness support. The 5-item instrument used by Standage et al. (2005), and many other investigators since, assesses the degree to which students perceive their PE teacher to support their relatedness, with items reflecting the extent to which one’s
teacher provides support, encourages working together, and is respectful, interested and friendly towards the students. It is encouraging that there are similarities between this item content and the indicators of relatedness support that we observed; however, our analyses (a) identified novel relatedness-supportive teacher behaviours that are not captured in existing measures (e.g., individualised conversation), and (b) provide a more intricate understanding of specific instructional practices used in the PE classroom that serve to support students’ relatedness needs. For instance, results from this study demonstrated specific teacher behaviours associated with showing a level of interest in students.

The secondary purpose of our study was to ascertain the student outcomes associated with the behavioural indicators of relatedness support. For the most part, the outcomes of relatedness support were largely consistent with previous basic needs research (Hagger et al., 2009; Standage et al., 2005; Standage et al., 2006), and included concepts such as engagement, intrinsic motivation, efficacy beliefs, and leisure-time outcomes. In similar regard, work with need satisfaction in PE has found that teacher behaviour is related to self-efficacy for PE, autonomous motivation for PE, autonomous motivation for leisure-time physical activity, and leisure-time activity levels (Hagger et al., 2009; Jackson et al., 2013). With particular relevance for interpersonal relationships within the PE classroom, affective responses and mood states largely reflected the notion of students specifically feeling more “comfortable” with their PE teacher, and more relaxed and happy in class, demonstrating that affective responses to relatedness-supportive teacher behaviours appeared to reflect the satisfaction of students’ relatedness needs. Interestingly, feeling comfortable around their teacher appeared to encourage more open student-teacher communication, increased attentiveness and reliance on the teacher, as well as more positive interactions with the teacher (inside and outside of the classroom).
Importantly, leisure-time outcomes were also identified by students to be associated with having experienced high levels of relatedness support from their PE teacher. Given that SDT (Deci & Ryan, 1985) proposes that the satisfaction of basic needs leads to more self-determined forms of motivation, and recent work has shown that leisure-time physical activity is also be linked to students’ perceptions of relatedness need support (Jackson et al., 2013), future work should be aimed at developing various relatedness-supportive instructional practices that can be applied in the PE classroom to facilitate positive intentions for, and engagement in, physical activity and sport outside of school. In doing so, it is clearly important to consider relatedness support alongside autonomy support and structure in order to obtain a comprehensive picture of how specific student outcomes are shaped by support for all three needs (individually and collectively). Moreover, the present study also revealed that students ascribed more favourable value (i.e., attitudinal) appraisals to the activities they covered in PE when they were delivered by a relatedness-supportive instructor. Accordingly, future work that accounts for leisure-time activity modality might be important in determining not simply the extent to which relatedness-supportive instruction encourages activity (in a general sense) outside school, but actually encourages the adoption of the specific activities (e.g., soccer, athletics) for which students received relatedness-supportive instruction.

By highlighting novel PE teacher behaviours considered to be relatedness-supportive, this investigation provides a framework for important future research directions. Most notably, the development of interventions designed to enhance teacher relatedness support within the PE classroom is needed in order to test the malleability of teachers’ interpersonal styles. Such work could also be used to elucidate the relative contribution of various teacher behaviours to students’ relatedness need satisfaction and various positive
outcomes (e.g., autonomous motivation, leisure-time physical activity). That is, although the students sampled in this study identified various factors that they perceived as being relatedness-supportive, further research is required to determine the magnitude of influence from each of these unique teacher behaviours to students’ perceived relatedness. Second, this study focused on teacher behaviours that students considered to be relatedness-supportive, and it would be worthwhile to concurrently investigate specific need thwarting teacher behaviours and the independent influence these behaviours may have on student outcomes.

It would also be interesting to determine whether certain dispositional characteristics on the part of students, for example personality traits and general causality orientations (i.e., autonomy versus controlled orientations), may moderate the relationship between teacher behaviours and student relatedness support/satisfaction perceptions. Within the five-factor (i.e., Big Five) model of personality, the agreeableness dimension is often associated with motives to maintain interpersonal relations (Jensen-Campbell & Graziano, 2001), and past work has also revealed that within social interactions highly autonomous individuals tend to be more honest and disclose more personal information than less autonomous individuals (Hodgins, Koestner, & Duncan, 1996). It would be intriguing, therefore, to examine whether these ‘receiver’ characteristics not only alter the lens through which individuals view and interpret a given teacher behaviour, but also elicit different behaviours from teachers. In terms of the student outcomes with which relatedness-support might be associated, it would also be of value to further investigate predictive relationships beyond sport-/physical activity-related contexts. For instance, it would be interesting to explore possible general school-focused outcomes (e.g., classroom engagement, pro-social school behaviours) that may stem, at least in part, from having
interpersonally-involving experiences within the PE classroom. Finally, it is important to note that our results may infer the existence of either direct and/or indirect relationships between students’ perceptions of relatedness support and emergent outcomes. For instance, recent SDT-based work (Jackson et al., 2013), and principles outlined within the transcontextual model (see Hagger & Chatzisarantis, 2012), indicate that perceptions of relatedness support may be linked indirectly to leisure-time outcomes, via relations with need satisfaction and/or autonomous motivation within PE. Thus, further investigation is warranted to identify specific direct and indirect pathways between students’ perceptions of relatedness support and these (and other) outcomes.

From an applied perspective, the results of this study suggest a number of implications for students and teachers in PE. The emergence of specific behavioural indicators for relatedness support provides teachers with practical strategies to support the development and maintenance of close relationships with their students in PE. For example, to bolster feelings of relatedness within the classroom, teachers may focus on engaging in unique and personal commentary with each student. Future intervention work could also seek to enhance some of the identified relatedness supportive teacher behaviours. For instance, the ability to perceive students’ feelings and emotions in class (awareness) and react accordingly (caring) may have important implications for relatedness need satisfaction in class. Such skills might be promoted through training in the use of instructional practices linked to transformational teacher (see Beauchamp & Morton, 2011) and/or emotional intelligent instruction (see Duncan, Latimer-Cheung, & Brackett, 2014). Interventions targeting pre-service and new teachers may be important, particularly the development and conduct of interpersonal teaching skills.
Several limitations of this study deserve consideration in terms of informing avenues for future research in the context of PE. First, although relatedness-supportive teacher behaviours were the focus of this study, it is important to note the shortcoming in isolating relatedness from autonomy and competence, and additional research that explores the ways in which all three psychological needs are supported (both uniquely and synergistically) within this context is warranted. Second, it is worth highlighting a methodological limitation of the current study insofar as the lead author conducted a majority of the interviews and was responsible for the first stage of data analysis. To overcome this, detailed peer review methods were used to assist in creating themes and categories that faithfully represented the data. Nevertheless, an additional safeguard that may have been used to further eliminate bias would have been to conduct follow-up interviews with students to establish consistency in their responses or to have participants review transcripts and summary findings to improve reliability.

In reflecting on the contribution of this study, although our focus was directed toward furthering our understanding of need support from an SDT perspective, the broader education literature may help provide insight into practical strategies that align with the themes (particularly those relating to sources of relatedness support) that we observed. Within traditional classroom settings, there exists a body of research focused on understanding and facilitating caring relationships between teachers and students (Cothran & Ennis, 1999, 2000; Ferreira & Bosworth, 2001; Teven, 2001; Teven & McCroskey, 1997; Vogt, 2002; Wentzel, 1997). This work has contributed to the development of certain teacher behaviours that are recognised as being caring and supportive, including helping students to understand class content better, encouragement during in-class tasks, treating students as individuals, and developing personal relationships with all students.
Although the terminology used to describe such characteristics varies, there exist similarities between the desirable characteristics outlined in the pedagogical literature and some of the relatedness-supportive behaviours that emerged in this study (e.g., individual attention and treating students as individuals). In terms of the unique contribution of our work, however, the guiding SDT framework that we employed enabled us to draw from established theory, and provides insight into the way in which these teacher behaviours are important for understanding motivational processes (and other student outcomes) within PE.

In conclusion, this study makes a number of important contributions to the extant SDT and PE literatures. Specifically, the results provide preliminary support for the specific teacher behaviours that students perceive to be relatedness-supportive in PE, and demonstrate that, collectively, these factors may be related to a number of salient student outcomes inside and outside of the classroom. Importantly, little work has isolated the key indicators of relatedness need support within the PE classroom, and results of this study provide important practical insight into need-supportive interpersonal climates. Future research is needed to establish the relative strength of the relationships between these specific teacher behaviours and students’ relatedness perceptions; however, the results offer unique insight into students’ perceptions of teacher behaviours that facilitate positive experiences within PE.
References


Chapter III. Modeling indicators and outcomes of students’ perceived teacher relatedness support in high school physical education

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Chapter III Foreword.

In Chapter II, I explored the specific teacher behaviours that students perceive to be relatedness supportive in PE, and provided preliminary evidence that, collectively, these factors may be related to a number of positive student outcomes. As an extension to this work, Chapter III will focus on the measurement of a distinct set of relatedness-supportive teacher behaviours (as identified by students), and explore the ways in which students’ perceptions about their teacher directly and/or indirectly related to various in-class outcomes.
Abstract

Research based in Self-Determination Theory has demonstrated the importance of social agents for motivational processes in school-based physical education (PE). To focus more closely on the relational processes that underpin students’ motivation in PE, there have been calls for researchers to explore the specific teacher behaviours that facilitate students’ relatedness in PE. Our aim was to test a higher-order measurement model comprising distinct relatedness-supportive teacher behaviours, and to explore the ways in which students’ perceptions about their teacher directly and/or indirectly predict relatedness need satisfaction and motivation in PE. To test our higher-order model (Study 1), 656 high-school PE students reported the extent to which their teachers engaged in relatedness-supportive behaviours. In Study 2, 570 high-school PE students reported their motivational regulations for PE, as well as the extent to which their teacher engaged in relatedness-supportive behaviours, and satisfied their need for relatedness. We found support for the higher-order relatedness support model, and observed predictive pathways that were consistent with theory. Students reported satisfaction of their need for relatedness when they felt relatedness support from their teachers ($\beta = .52, p < .001$) and relatedness need satisfaction was in turn positively related to intrinsic ($\beta = .51, p < .001$), identified ($\beta = .49, p < .001$), and introjected ($\beta = .25, p < .001$) regulations for PE. These findings demonstrate the importance of relatedness-supportive teaching in PE, and implications of these data are discussed.
Introduction

School-based physical education (PE) provides widespread, formalised access to regular physical activity, and thus, it is no surprise that researchers have focused attention toward understanding the social factors that contribute to students’ motivation and engagement within this setting. In seeking to understand the ways in which students’ in-class perceptions are shaped, much attention has been focused around the role that teachers play in determining the motivational dynamics within the classroom (see Furrer & Skinner, 2003; Koka & Hagger, 2010). Similar to more traditional classroom settings, the interpersonal style of the PE teacher has been shown to influence student motivation and engagement in school PE (e.g., Cox et al., 2009; Taylor & Ntoumanis, 2007). Alongside pertinent in-class outcomes, studies in this area have also shown that motivational experiences in PE may also align with greater leisure-time physical activity (Chatzisarantis & Hagger, 2009; Jackson et al., 2013).

A number of PE-based studies have explored the role of the teacher in shaping students’ motivation through the lens of Self-Determination Theory (SDT; Deci & Ryan, 1985), a theoretical framework concerned with the individual and social factors that elicit different types of motivation. According to SDT, one’s motives to pursue an activity may fall along a self-determination continuum, ranging from highly autonomous (or self-determined) to highly controlled behavioural regulations. Self-determined forms of motivation are characterised by participation in an activity for fun, interest, enjoyment (i.e., intrinsic motivation), in light of its consistency with one’s values/identity (i.e., integrated regulation), and/or valued outcomes that it provides (i.e., identified regulation). These types of motivation are theorised to nourish persistence, engagement, and psychological well-
being (Deci & Ryan, 2000). Within SDT, needs for autonomy (i.e., a sense of choice and volition), competence (i.e., feeling capable in one’s pursuits), and relatedness (i.e., feeling valued/supported by, and connected to, significant others) are considered universal psychological nutriments through which self-determined motivation is catalyzed. When important others engage in behaviours that support one’s needs for autonomy, competence, and relatedness, therefore, it is proposed that relatively more self-determined forms of motivation will result through the fulfillment of each psychological need. Consequently, perceptions of highly need-supportive environments will indirectly support various desirable outcomes (e.g., engagement, persistence, enjoyment), through need satisfaction and the endorsement of higher-quality (i.e., self-determined) motivation. Based on these proposed relationships, researchers within and beyond PE have focused on the role of need-supportive teaching in facilitating self-determined motivation and positive in-class engagement.

The specific teacher instructional practices that students feel are supportive of their needs in PE have received some empirical attention (Chatzisarantis & Hagger, 2009; Cheon et al., 2012). Importantly though, much of this work has focused on autonomy-supportive teacher behaviours, with less attention devoted to support for competence, and in particular, relatedness (see Standage & Emm, 2014; Van den Berghe, Vansteenkiste, Cardon, Kirk, & Haerens, 2014). Indeed, relatively limited attention has been directed toward charting the specific relatedness-supportive or interpersonally involving practices in which PE teachers engage, and the extent to which these behaviours satisfy students’ feelings of relatedness. The few studies focusing on students’ perceptions of relatedness support have examined teachers’ emphasis on cooperation (Ntoumanis, 2001) and provision of autonomy support.
(see Standage et al., 2007), as well as emotional support and promotion of a mastery climate (Cox & Williams, 2008) as predictors of students’ relatedness support. Within sporting contexts, need support studies have shown that athletes’ sense of relatedness is supported by both coach facilitation of friendship with peer athletes (Keegan, Harwood, Spray, & Lavallee, 2009) and provision of assistance and emotional support (Reinboth, Duda, & Ntoumanis, 2004). Importantly, feeling meaningfully related to significant others is critical to the process of internalisation (i.e., people’s “taking in” of attitudes, values, or opinions of others into one’s identity or sense of self), a driver of self-determined motivation (Deci & Ryan, 1985). In light of the fundamental need that individuals have for experiencing close interpersonal connections and the central importance of relatedness need satisfaction for the internalisation of prescribed values and behaviours (Baumeister & Leary, 1995; Deci & Ryan, 2000), it is important to understand students’ perceptions about the distinct teacher behaviours that serve to foster a sense of relatedness in PE.

With limited work devoted to the relatedness-supportive teacher behaviours likely to help students feel socially connected, and fully internalise the value of behaviours, there have been recent calls for researchers to more closely explore the specific teacher behaviours that underpin relatedness support in PE (Standage & Emm, 2014; Van den Berghe et al., 2014). Guided by this recommendation, and using SDT as a foundation, in Chapter II we interviewed a sample of high school PE students with the aim of identifying specific instructional practices demonstrated by their current and past PE teachers that they considered to be relatedness-supportive in nature. Teacher behaviours identified as highly relatedness-supportive emerged in relation to individualised conversation, task-related support, promotion of cooperation and teamwork, demonstrating awareness, showing care,
and engaging in general friendly communication. Analyses also revealed a number of putative outcomes that stemmed from relatedness-supportive instruction, reflecting positive affective responses as well as high levels of in-class engagement, intrinsic motivation, and efficacy beliefs. Importantly, these findings not only provided insight into the discrete instructional practices that students consider to be relatedness-supportive, but also reinforced the implications that these behaviours have for students’ PE experiences. In line with this work, our aim was to test a higher-order measurement model containing teacher behaviours viewed as relatedness-supportive (Chapter II), and to explore the ways in which students’ perceptions about their teacher directly and/or indirectly predict relatedness need satisfaction and motivation in PE.

**Study 1: Second-order Factor Analytic Model**

Our focus in Study 1 was to investigate a set of relatedness-supportive teacher behaviours previously identified in Chapter II of this thesis by (a) identifying existing instruments that adequately represent each teacher behaviour (dimension), and (b) employing a second-order confirmatory factor analysis utilising the established instruments to examine the factor structure of our hypothesised model. To determine the various measures that would be entered into the second-order factor analysis, we conducted a search of relevant literature with the goal of compiling instruments that have demonstrated validity evidence and that represented perceptions regarding the provision of individualised conversation, task-related support, cooperation and teamwork, enthusiasm, awareness, care, and general friendly communication. Any existing instruments that corresponded conceptually to each dimension of relatedness support were presented to two expert reviewers (both associate professors in sport and exercise psychology) who have conducted
work within PE contexts utilising a SDT framework. Reviewers were provided with a
definition of each teacher behaviour, as well as the various instruments purported to reflect
each behaviour. To establish content validity, expert reviewers were asked to provide
qualitative feedback with respect to item content, and to assign each instrument to a
specific teacher behaviour construct. Following reviewer feedback and discussion between
authors, instruments with the highest ratings were retained for inclusion in the second-order
model, and this decision was based on (a) their appropriateness for use with high-school PE
samples, and (b) the consideration that the items within the instrument mapped
conceptually onto a specific relatedness-supportive teacher behaviour identified in Chapter
II.

For all but one teacher behaviour (i.e., individualised conversation), suitable
instruments were identified to represent lower-order factors in the proposed model. For the
*individualised conversation* construct, a pool of five items was created, which reflected the
content of this behaviour as specified in Chapter II (i.e., Chapter II defined *individualised
conversation* as direct commentary provided by the teacher that is individualised and
unique to a student which shows a deeper understanding and apparent interest in the student
outside of the task at hand). As well, item development was informed by relevant SDT texts
(e.g., Deci & Ryan, 2000) outlining the need for relatedness, so that the conceptualisation
of this construct was reflected in the item content. Based on the conceptual definition
provided by the first author, the expert reviewers were asked to provide qualitative
feedback with respect to item ambiguity, understanding, overlap, representativeness, and
jargon (Delgado-Rico, Carretero-Dios, & Ruch, 2012). Based on reviewer feedback, we
made changes to the item pool. These items were modified/rewritten or removed when
reviewers indicated they lacked specificity, were ambiguous, tapped into more than one concept, or did not accurately or fully represent the intended construct. Following several iterations of the review process, consensus was reached on an instrument comprising of five items (which were all given good ratings by the reviewers). As a result, the assessment of lower-order relatedness support factors comprised six established instruments and one newly-developed instrument.

The second purpose of Study 1 was to examine the factor structure of our hypothesised second-order model. From a conceptual perspective, we expected that the proposed second-order model would display acceptable fit given that the seven constructs measured (i.e., first-order factors) would be positively related to each other, and that all seven constructs would also load strongly onto a global second-order factor (i.e., relatedness support). Figure 3.1 illustrates the hypothesised second-order model, whereby relatedness support represents a higher-order factor accounting for the commonality among the seven first-order teacher behaviour factors. To test our hypothesised model, a second-order confirmatory factor analysis (CFA) was estimated among a sample of high-school PE students. Based on the conceptualisation of relatedness support that exists within the SDT literature (Deci & Ryan, 2000, 2014), we expected that this model would display acceptable fit, and that the seven first-order factors would all load strongly onto a global latent relatedness support variable.
Figure 3.1. Hypothesised second-order model of relatedness support. Bi-directional arrows indicate correlations between first-order factors. Although diagram presents correlations between adjacent first-order factors, correlation between all factors were specified in the model.
Method

Participants. Data were provided by 656 male and female high school PE students (males = 509, females = 147, $M_{age} = 13.70, SD = .96$). The students were recruited from 4 independent schools within Sydney Metropolitan Area, from a total of 32 different PE classes. Given that decreases in physical activity levels are well-documented in adolescent populations (see Tremblay et al., 2011), grades 7, 8, and 9 (i.e., aged 11 to 14) were selected to be our study population. All participants took part in weekly compulsory PE, which was delivered across two or three class periods each lasting 50 minutes.

Procedures. After obtaining permission to conduct the study from the Human Research Ethics Board at the lead authors’ institution, recruitment letters were distributed to principals at several independent high schools. Potential participants were informed that participation was voluntary, that all responses would remain confidential at all times, and that any party could withdraw from the study at any time. After obtaining informed consent from principals and teachers, parent/guardian information sheets were distributed, in which parents/guardians were informed of the nature of the study and were provided with a pre-paid return envelope should they wish to withdraw their child from the study ahead of data collection. Appointments were subsequently made for a research assistant to visit each school between two and three weeks later to complete data collection. Data collection sessions were scheduled at the beginning of the students’ PE class. Before collection commenced, students were provided with a written information sheet outlining that their participation was voluntary, their right to withdraw or refuse to answer any question, and that all data would remain confidential at all times. After being given the opportunity to ask questions, students provided their informed consent and completed the
questionnaire. All instruments were completed before participation in scheduled PE, and students were directed to respond to each question in relation to how they felt at that moment in time.

**Measures.**

*Individualised conversation.* A five-item measure of perceived individualised conversation was created to assess students’ perceptions of how their teacher engages and converses with them. Items were created to capture teacher communication that showed a deeper understanding of the student and an interest in the student outside of the task at hand. Using a scale anchored at 1 (*strongly disagree*) and 5 (*strongly agree*), the five items were, “my PE teacher tries to get to know me as an individual”, “my PE teacher asks me about my personal interests”, “my PE teacher talks to me about things that are going on in my life”, “my PE teacher talks to me in a friendly way”, and “my PE teacher is interested in the things I do outside of PE”.

*Task-related support.* Students’ perceptions of task-related support provided by their teacher were measured using items from two sub-scales from the Perception of the Teacher’s Feedback questionnaire (PTF; Koka & Hein, 2005). The sub-scales were ‘positive general feedback’ (three items) and ‘knowledge of performance’ (three items), and included, “in my PE class, I am frequently encouraged by my PE teacher” (positive general feedback), and “in my PE class, my PE teacher often gives me instruction and feedback” (knowledge of performance). Responses were made on a five-point scale anchored at 1 (*strongly disagree*) and 5 (*strongly agree*). Previous work with students has demonstrated support for the structural properties and internal consistency of measures derived from the PTF (Koka & Hein, 2005).
Promoting cooperation and teamwork. Using a scale developed by Ryan and Patrick (2001) to measure social interaction in academic settings, students reported their perceptions of the extent to which their teacher promoted cooperation and teamwork in their PE class. To minimise redundancy and potential overlap at the request of the teachers, one item (“my teacher encourages us to get to know all the other students in class”) was dropped from the scale given its conceptual similarity to another item (i.e., “my teacher encourages us to get to know our classmates’ names”). The term “PE” was added to the items where appropriate, and students responded to seven items (e.g., “my teacher encourages us to be helpful to other students in PE”) on a five-point scale ranging from 1 (not at all true) to 5 (very true). Ryan and Patrick (2001) demonstrated evidence of internal consistency, as well as convergent and discriminant validity by documenting associations between scores on this scale and assessments of social and academic efficacy, self-regulated learning, and disruptive behaviour.

Teacher enthusiasm. Students’ perceptions of their teacher’s enthusiasm for teaching PE were captured by a three-item scale created by Kunter et al. (2008). The term “PE” was added before the word “teacher”, and students responded to items (e.g., “my PE teacher seems to really enjoy teaching”) on a four-point scale anchored at 1 (strongly disagree) and 4 (strongly agree). Previous work has demonstrated support for the structural validity and internal consistency of measures derived from this instrument (Kunter et al., 2008).

Teacher Awareness. Students’ perceptions of their PE teacher’s awareness in the classroom were assessed using the individualised consideration subscale from the Transformational Teaching Questionnaire (TTQ; Beauchamp et al., 2010). The four-item
subscale has responses anchored on a five-point rating scale from 0 (*not at all*) to 4 (*frequently*). Items included “my PE teacher tries to help students who might be struggling”, and “my PE teacher recognises the needs and abilities of each student in the class”. Beauchamp et al. (2010) demonstrated evidence of acceptable internal consistency, as well as structural, content, and concurrent validity for measures derived from the TTQ.

**Teacher care.** To measure students’ perceptions of teacher care, a four-item measure, modified by Ryan and Patrick (2001), was used to assess the degree to which students believed their teacher cared about and understood them as individuals. This measure has been used predominately in academic settings; therefore, “PE” was added before the word “teacher”, and students responded to items (e.g., “does your PE teacher try to help you when you are sad or upset?”) on a five-point scale anchored at 1 (*not at all*) and 5 (*very much*). Previous work has demonstrated evidence of construct validity and reliability for measures derived from this instrument in classroom settings (Cox et al., 2009; Ryan & Patrick, 2001).

**General friendly communication.** The three-item ‘accessible’ subscale from the Teacher Support Scale (Metheny, McWhirter, & O’Neil, 2008) was used to measure students’ perceptions of how friendly and approachable their teacher is (e.g., “my PE teacher is easy to talk to about school things”). Metheny et al. (2008) provided evidence to support the construct validity and reliability of scores derived from this subscale. Two additional items (i.e., “my PE teacher knows when to make jokes with students”, “my PE teacher is friendly and approachable”) were also developed to capture other verbal/non-verbal communication that were reported in Chapter II. Item responses were anchored on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).
Data Analysis. Data were first examined for univariate (i.e., standardised scores, \(|z|\geq 3.30\)) and multivariate outliers (i.e., Mahalanobis distance at \(p<.001\); Tabachnick & Fidell, 2007), and descriptive statistics were computed using IBM SPSS Version 22. To determine composite reliability estimates (Raykov, 1997) and to explore the factor structure of the proposed measurement model, a second-order CFA was conducted using Mplus Version 7.3. A second-order model was chosen to reflect the hypothesis that the seven conceptually distinct teacher behaviours would be related to one another and would be represented by (i.e., sit beneath) a global relatedness support construct. Given that students were nested within classes, we implemented a “Type = Complex” correction for nonindependence of observations based on student clustering (Rabe-Hesketh & Skrondal, 2006). Missing data (which comprised 0.4% of all cases) were handled using the Mplus default full information maximum likelihood (FIML) approach. We implemented maximum likelihood parameter estimates (MLR) with standard errors and a chi-square test statistic that are robust to non-normality (Muthén & Muthén, 1998-2012). In line with recommendations by Tabachnick and Fidell (2007), and in accordance with the available output provided within Mplus, a range of indices were considered when assessing model fit. We examined the \(\chi^2\) goodness-of-fit index, the comparative fit index (CFI), Tucker-Lewis index (TLI), standardised root mean square residual (SRMR), and root mean square error of approximation (RMSEA). Close fit was judged when CFI and TFI \(\geq .95\), SRMR \(\leq .08\), and RMSEA \(\leq .06\) (Hu & Bentler, 1999; Tabachnick & Fidell, 2007). When interpreting the strength of factor loadings, we utilised Comrey and Lee’s (1992) recommendations (i.e., >.55 = good, .45-.55 = fair, .32-.45 = poor, <.32 = should not be interpreted).
Results

Descriptive statistics and item-level analyses. Skewness and kurtosis values were inspected for all perceptions of teacher behaviour items; no major departures from normality were observed, and the deletion of items would not have improved internal consistency for any of the measures (see Table 3.1 for composite reliability estimates). All of the items (as described in the measures section) were retained for further analyses.
Table 3.1. **Study 1 first-order CFA factor loadings and descriptive information**

<table>
<thead>
<tr>
<th>Subscale and item</th>
<th>Factor loading</th>
<th>Mean</th>
<th>SD</th>
<th>p</th>
<th>ICC</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC Tries to get to know me as an individual</td>
<td>.80</td>
<td>3.80</td>
<td>.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC Asks me about my personal interests</td>
<td>.69</td>
<td>3.14</td>
<td>1.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC Talks to me about things that are going on in my life</td>
<td>.62</td>
<td>2.84</td>
<td>1.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC Talks to me in a friendly way</td>
<td>.69</td>
<td>4.38</td>
<td>.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC Is interested in the things I do outside of PE</td>
<td>.61</td>
<td>3.31</td>
<td>1.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TS I am frequently encouraged by my PE teacher</td>
<td>.75</td>
<td>4.07</td>
<td>.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TS When I do well in PE, my PE teacher confirms that</td>
<td>.72</td>
<td>4.12</td>
<td>.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TS If my teacher sees that I try very hard in PE, I’ll always get praise</td>
<td>.70</td>
<td>3.72</td>
<td>1.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TS My teacher instructs me frequently</td>
<td>.66</td>
<td>3.92</td>
<td>.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TS My PE teacher often praises me</td>
<td>.66</td>
<td>3.26</td>
<td>1.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TS My PE teacher often gives me instruction and feedback</td>
<td>.72</td>
<td>4.09</td>
<td>.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCT My teacher allows us to talk about the things we do in PE with classmates</td>
<td>.70</td>
<td>3.85</td>
<td>.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCT My teacher lets us ask other students for help if we need it</td>
<td>.74</td>
<td>3.96</td>
<td>.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCT My teacher encourages us to share ideas with one another in class</td>
<td>.76</td>
<td>3.93</td>
<td>.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCT My teacher encourages us to get to know our classmates’ names</td>
<td>.62</td>
<td>4.15</td>
<td>.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCT My teacher encourages us to be helpful to other students in PE</td>
<td>.77</td>
<td>4.20</td>
<td>.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCT If you have a problem in PE class, you can just talk to someone about it</td>
<td>.68</td>
<td>3.85</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale</td>
<td>Item</td>
<td>M</td>
<td>SD</td>
<td>ICC</td>
<td>ρ</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------------------------------</td>
<td>------</td>
<td>------</td>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td>PCT</td>
<td>People in my PE class often work together</td>
<td>.55</td>
<td>4.02</td>
<td>.93</td>
<td>.86</td>
</tr>
<tr>
<td>TE</td>
<td>My PE teacher seems to really enjoy teaching</td>
<td>.84</td>
<td>3.56</td>
<td>.59</td>
<td>.86</td>
</tr>
<tr>
<td>TE</td>
<td>My PE teacher is an enthusiastic teacher</td>
<td>.84</td>
<td>3.54</td>
<td>.59</td>
<td>.86</td>
</tr>
<tr>
<td>TE</td>
<td>My PE teacher is enthusiastic about the subject of PE</td>
<td>.75</td>
<td>3.68</td>
<td>.53</td>
<td>.85</td>
</tr>
<tr>
<td>TA</td>
<td>Shows that he/she cares about me</td>
<td>.76</td>
<td>3.93</td>
<td>.86</td>
<td>.85</td>
</tr>
<tr>
<td>TA</td>
<td>Tries to know every student in the class</td>
<td>.68</td>
<td>4.33</td>
<td>.82</td>
<td>.80</td>
</tr>
<tr>
<td>TA</td>
<td>Tries to help students who might be struggling</td>
<td>.67</td>
<td>4.45</td>
<td>.71</td>
<td>.80</td>
</tr>
<tr>
<td>TA</td>
<td>Recognises the needs and abilities of each student in the class</td>
<td>.72</td>
<td>4.28</td>
<td>.81</td>
<td>.80</td>
</tr>
<tr>
<td>TC</td>
<td>Does your PE teacher respect your opinion?</td>
<td>.84</td>
<td>4.13</td>
<td>.85</td>
<td>.87</td>
</tr>
<tr>
<td>TC</td>
<td>Does your PE teacher really understand how you feel about things?</td>
<td>.80</td>
<td>3.70</td>
<td>.98</td>
<td>.87</td>
</tr>
<tr>
<td>TC</td>
<td>Does your PE teacher try to help you when you are sad or upset?</td>
<td>.68</td>
<td>4.54</td>
<td>.84</td>
<td>.87</td>
</tr>
<tr>
<td>TC</td>
<td>Can you count on your PE teacher for help when you need it?</td>
<td>.85</td>
<td>4.04</td>
<td>.98</td>
<td>.87</td>
</tr>
<tr>
<td>GFC</td>
<td>Will listen if I want to talk about a problem</td>
<td>.83</td>
<td>4.02</td>
<td>.91</td>
<td>.87</td>
</tr>
<tr>
<td>GFC</td>
<td>Is easy to talk to about school things</td>
<td>.84</td>
<td>4.01</td>
<td>.95</td>
<td>.87</td>
</tr>
<tr>
<td>GFC</td>
<td>Is easy to talk to about things beside school</td>
<td>.72</td>
<td>3.63</td>
<td>1.09</td>
<td>.87</td>
</tr>
<tr>
<td>GFC</td>
<td>Knows when to make jokes with students</td>
<td>.63</td>
<td>4.25</td>
<td>.93</td>
<td>.87</td>
</tr>
<tr>
<td>GFC</td>
<td>Is friendly and approachable</td>
<td>.76</td>
<td>4.33</td>
<td>.88</td>
<td>.87</td>
</tr>
</tbody>
</table>

Note. ρ = composite reliability estimate, all were acceptable (≥ .70; Raykov, 1997); ICC = Intraclass correlation coefficient calculated by averaging the ICCs of the items in each scale. IC = Individualised conversation; TS = Task-related support; PCT = Promoting cooperation and teamwork; TE = Teacher enthusiasm; TA = Teacher awareness; TC = Teacher care; GFC = General friendly communication.
CFA. Examination of the fit indices indicated that the data appeared to be an adequate fit for the 34-item model that included all measurement parameters and structural pathways, $\chi^2 (520) = 1445.16, p < 0.001$, CFI = .91, TFI = .91, SRMR = .05, RMSEA = .05 (90% CI: .05, .06). To compare the fit of this model with one in which there was no higher-order construct specified, we examined a model with no higher-order relatedness support variable. The removal of the higher-order factor did not appear to alter model fit significantly, $\chi^2 (506) = 1389.09, p < 0.001$, CFI = .91, TFI = .91, SRMR = .05, RMSEA = .05 (90% CI: .05, .06), and the $\chi^2$ difference test indicated that the alternate model (no higher-order factor) was a significantly worse fit with the data when compared with the original model, $\Delta \chi^2 (14) = 70.34, p < .001$; therefore, the original higher-order model was retained because the lower-order factors should, conceptually speaking, all load onto a global construct. To optimise model fit for this higher-order model, we used the modification indices that were provided in our initial analysis to specify a number of measurement-based model improvements. As a rule of thumb, modification indices above 5 are generally considered large enough for a researcher to consider amending a model (Kelloway, 1998). In accordance with this cut-off point, we implemented this approach based on Meehl’s (1990) contention that, to a certain degree, all variables are related to all others. We incorporated nine feasible modifications to the model by specifying error covariances between selected indicators within some latent variables based on items sharing similar wording (e.g., “my teacher encourages us to get to know our classmates’ names”/“my teacher encourages us to be helpful to other students in PE”), and items with high content overlap (e.g., “Does your PE teacher try to help you when you are sad or upset?”/“Can you count on your teacher for help when you need it?”).
Following these modifications, we observed an improvement in fit indices, χ² (510) = 1045.90, p < .001, CFI = .95, TLI = .95, SRMR = .04, and RMSEA = .04 (90% CI: .04, .05), indicative of a relatively close-fitting model. Standardised factor loadings for the loading of items onto their respective first-order factors are presented in Table 3.1. All loadings were considered good (i.e., >.55) according to Comrey and Lee’s (1992) guidelines, with the exception of one loading within the ‘promoting cooperation and teamwork’ subscale, which was exactly .55 (i.e., rated as fair). Standardised factor loadings of the lower-order latent variables onto the higher-order global relatedness support variable are presented in Table 3.2, and all were considered good (i.e., >.55). Mean scores and standard deviations for the indicators that represented the seven latent teacher behaviour dimensions are presented in Table 3.1, alongside composite reliability estimates and the intraclass correlation coefficients (ICC; i.e., the variance in student responses accounted for by class membership) derived from scores obtained from these measures. The ICC was calculated for each latent variable (teacher behaviours) by averaging the ICCs of each scale’s items. Standardised factor loadings for the second-order factor (relatedness support), as well as aggregate-level means and standard deviations, are presented in Table 3.2.
Table 3.2. *Loading of first-order factors on the second-order factor and descriptive information*

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Factor loading</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relatedness support</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individualised conversation</td>
<td>.90</td>
<td>3.49</td>
<td>.82</td>
</tr>
<tr>
<td>Task-related feedback</td>
<td>.89</td>
<td>3.86</td>
<td>.72</td>
</tr>
<tr>
<td>Promoting cooperation and teamwork</td>
<td>.84</td>
<td>3.99</td>
<td>.70</td>
</tr>
<tr>
<td>Teacher enthusiasm</td>
<td>.77</td>
<td>3.59</td>
<td>.50</td>
</tr>
<tr>
<td>Teacher awareness</td>
<td>.97</td>
<td>4.24</td>
<td>.63</td>
</tr>
<tr>
<td>Teacher care</td>
<td>.88</td>
<td>4.10</td>
<td>.75</td>
</tr>
<tr>
<td>General friendly communication</td>
<td>.94</td>
<td>4.05</td>
<td>.77</td>
</tr>
</tbody>
</table>
Study 2: Path Analysis

The purpose of Study 2 was to investigate how our operationalisation of relatedness support was related to a series of theoretically-derived concepts. To confirm alignment with SDT (Deci & Ryan, 2000), we first sought to determine whether our relatedness support construct was a strong predictor of relatedness need satisfaction perceptions. In order to provide a more robust test of this relationship, however, we also controlled for other potential predictors of relatedness need satisfaction. Specifically, we modeled students’ perceptions of autonomy support and structure (i.e., competence support) alongside relatedness support, given that the support for a given need (e.g., autonomy support) may promote satisfaction not only of that need (i.e., autonomy need satisfaction), but also other needs (Deci & Ryan, 2014). Similarly, we also sought to demonstrate that our relatedness support variable aligned strongly with relatedness need satisfaction while controlling for the potential effects associated with relevant individual difference variables. Dispositional factors – namely agreeableness and one’s need to belong – were measured in light of the potential for individuals scoring differently on these variables to view their relationship with their teacher (and hence their relatedness need satisfaction) through a different lens (Carvallo & Gabriel, 2006; Jackson, Dimmock, Gucciardi, & Grove, 2011). Measures of motivational regulations (i.e., intrinsic, identified, introjected, external, amotivation) were selected as they represent important outcomes that are relevant in physical activity settings (Jackson et al., 2013), and so that indirect relations could be modeled between the relatedness support variable and the central motivational components outlined within SDT.

Methods for modeling behavioural regulation using SDT-based instruments have often historically used a composite variable called the relative autonomy index (RAI; Ryan &
Connell, 1989), whereby aggregate scores for each behavioural regulation are computed, and then weighted in order to provide a single score reflecting one’s autonomous (relative to one’s controlled) motivation. To our knowledge, though, no PE-based study has specifically explored links between relatedness need satisfaction and each motivational regulation for PE, and for this reason, we implemented an approach in which each of the behavioural regulations were separated, allowing us to explore the unique pathways associated with each construct. We hypothesised that relatedness support, alongside both autonomy support and competence support, would be positively related to relatedness need satisfaction. We also anticipated that relatedness need satisfaction would be associated positively with intrinsic motivation and identified regulation, and negatively associated with introjected regulation, external regulation and amotivation. Hypothesised direct relationships between variables are presented in Figure 3.2
Figure 3.2. Illustration of proposed model. Solid line indicates pathway was hypothesised to be positive in nature. Dashed line indicates that the relationship was hypothesised to be negative in nature. Relatedness support variable = composite score created by seven teacher behaviours (individualised conversation, task-related support, promoting cooperation and teamwork, teacher enthusiasm, teacher awareness, teacher care, and general friendly communication). In our analysis, pathways from relatedness need satisfaction were proposed to predict each of the five regulations separately.
Method

Participants and procedures. In total, 570 PE students (males = 200, females = 370, $M_{age}$ = 13.93, $SD$ = 1.04), from grade seven through 10 participated in the study. The students were recruited from 34 different PE classes in four independent high schools in the Perth metropolitan area. All participants took part in weekly compulsory PE, which was delivered across two or three class periods each lasting 50 minutes. The study was approved by the Human Research Ethics Board at the lead authors’ institution, and recruitment, consent, and data collection procedures were identical to those described in Study 1.

Measures.

Relatedness support. Students’ perceptions of relatedness support were assessed using all items from the seven subscales described in Study 1 of this chapter.

Agreeableness. The agreeableness subscale from the Big Five Inventory (BFI; John, Donahue, & Kentle, 1991) was utilised to measure students’ general concern for social harmony (e.g., the degree to which individuals are altruistic, trusting, cooperative, and collegial in nature; Neuman & Wright, 1999). For each of the nine items, students answered on a scale from 1 (disagree strongly) to 5 (agree strongly). Preceding each statement, the instruction, “At school, I see myself as someone who…” was presented, and sample items included “tends to find fault with others” (reverse scored), and “is considerate and kind to almost everyone”. Means were calculated, with higher scores reflecting greater levels of agreeableness. Soto and John (2009) provided support for the reliability and validity of measures derived from the BFI.

Need to Belong. To assess students’ general need for connectedness, the 10-item Need to Belong Scale (NTBS; Baumeister & Leary, 1995) was used. For each item,
students responded to statements (e.g., “If other people don’t seem to accept me, I don’t let it bother me”) anchored at 1 (strongly disagree) and 5 (strongly agree). Mean scores were created, whereby higher scores indicated a stronger desire to relate to and be accepted by other people. Several studies have demonstrated acceptable psychometric properties of scores derived from the NTBS (e.g., Leary, Kelly, Cottrell, & Schreindorfer, 2013).

**Relatedness need satisfaction.** Students’ perceptions of relatedness need satisfaction were measured using the five-item acceptance subscale from the Need for Relatedness Scale (Richer & Vallerand, 1998). The stem presented was “With my teacher in this PE class I feel…”, and items pertained to feeling safe, valued, listened to, supported, and understood. All responses were answered on a seven-point scale anchored at 1 (strongly disagree) and 7 (strongly agree). A mean relatedness score was created, with higher scores indicating greater need satisfaction. A number of studies within the context of PE have provided evidence for reliability and validity of scores derived from this scale (Standage et al., 2003; Standage et al., 2005).

**Autonomy support.** To assess the degree to which students perceived their PE teacher to be autonomy-supportive, we used a modified version of the six-item Learning Climate Questionnaire (LCQ; Standage et al., 2006; Williams & Deci, 1996). Preceded by the stem, “In this PE class…”, students answered on a seven-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). Example items included, “we feel that the PE teacher provides us with choices and options”, and “the PE teacher encourages us to ask questions”. A mean autonomy support score was calculated, with higher scores reflecting greater perceived autonomy supportive PE teacher behaviours. Existing work (e.g.,
Standage et al. (2006) has demonstrated support for the reliability and validity of scores derived from the six-item LCQ with a sample of PE students).

Competence support. To assess the degree to which students perceived their PE teacher to be competence-supportive, a four-item scale developed by Standage et al. (2005) was administered. All items were anchored on a seven-point scale ranging from 1 (strongly disagree) to 7 (strongly agree), and example items included, “the PE teacher helps us to improve”, and “the teacher makes us feel like we are good at PE”. Standage et al. (2005) reported evidence of acceptable reliability for measures derived from this instrument with a sample of high school students.

Motivation. To measure students’ motivational regulations for PE, we used the 20-item Perceived Locus of Causality (PLOC) questionnaire (Goudas, Biddle, & Fox, 1994). Preceded by the stem “I take part in PE classes,”, the PLOC scale contains items assessing intrinsic motivation (four items, e.g., “because I enjoy learning new skills”), identified regulation (four items, e.g., “because I want to improve in sport”), introjected regulation (four items, e.g., “because I want the teacher to think I am a good student”), external regulation (four items, e.g., “because I’ll get in trouble if I don’t”), and amotivation (four items, e.g., “but I don’t really know why”). Students responded on a seven-point scale anchored at 1 (strongly disagree) and 7 (strongly agree). Composite scores were created for each motivational construct, with higher scores reflecting greater levels of the regulation. Recent investigations have provided support for the reliability and validity of scores derived from the instrument (Jackson et al., 2013; Lonsdale, Sabiston, Taylor, & Ntoumanis, 2011).
**Data analysis.** Data were examined for univariate (i.e., standardised scores, \(|z| \geq 3.30\)) and multivariate outliers (i.e., Mahalanobis distance at \(p < .001\); Tabachnick & Fidell, 2007), and descriptive statistics were calculated using IMB SPSS Version 22. Initially, an exploratory structural equation model (ESEM) was conducted using Mplus Version 7.3, and we again implemented a correction for nonindependence of observations (Rabe-Hesketh & Skrondal, 2006). The ESEM (Asparouhov & Muthén, 2009) technique conducted allowed for approximate zero cross-loadings between relatedness support, autonomy support, and competence support indicators with respect to their non-intended latent variables. This analysis was conducted on the basis of high correlations initially observed between relatedness support, autonomy support, and competence support latent variables, and other relevant literature reporting similar findings (Koka & Hagger, 2010; Taylor & Lonsdale, 2010). The aim of this ESEM was primarily to determine if the 35 relatedness support items loaded primarily (and meaningfully) onto their intended (higher order) latent variable (i.e., relatedness support), and to examine cross-loadings onto the other variables (i.e., autonomy support and competence support). Analyses revealed that all relatedness support items loaded primarily (and meaningfully) onto their intended latent variable; however, the initial ESEM analysis revealed problems with the competence support measure (i.e., the competence support items cross-loaded strongly onto the autonomy support latent variable, and loaded weakly onto their intended latent variable). For these reasons, we decided to remove the competence support measure from subsequent analyses. We have included further information about this analysis, along with specific output, as supplementary material to the manuscript (see Appendix B).
To examine the relations among variables, a path analysis was conducted. Consistent with Figure 3.2, and for the sake of parsimony given the number of variables, we specified a single model in which all variables were modeled as single-item observed variables, with the exclusion of relatedness support, which was specified as a latent variable represented by aggregate scores from the seven teacher behaviour dimensions. A composite reliability estimate (ρ = .91) was calculated for our latent relatedness support variable using aggregate scores from each of the seven perceptions of teacher behaviour scales. The correction for nonindependence of observations (i.e., student clustering), estimation method (i.e., MLR) and handling of missing data (<0.5% of all cases) were all identical to Study 1, and we requested direct and indirect predictive pathways between variables of interest. Conclusions regarding model fit and factor loadings were based on the criteria outlined in Study 1.

**Results**

**Descriptive statistics and fit indices.** Mean (and SD) scores for the seven teacher behaviours ranged from 3.05 (.74) to 3.84 (.85), and ICCs (calculated for each latent variable by averaging the ICCs of each scale’s items) ranged from .03 to .13. Standardised factor loadings for the seven indicators of relatedness support onto the latent variable were in the range .66 to .87. Zero-order correlations between all aggregate variables appear in Table 3.3. Correlations between relatedness support dimensions and autonomy support appear in Table 3.4 (range = .53 to .71), and correlations between all relatedness support dimensions appear in Table 3.5 (range = .41 to .76). The data were a close overall fit for a single model that included all measurement and structural parameters, χ² (78) = 175.99, p < 0.001, CFI = .98, TFI = .97, SRMR = .04, RMSEA = .05 (90% CI: .04, .06).
Table 3.3. *Zero-order correlations between relatedness support and all other variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Relatedness support</td>
<td>.43*</td>
<td>.16*</td>
<td>.81*</td>
<td>.77*</td>
<td>.50*</td>
<td>.47*</td>
<td>.22*</td>
<td>-.02</td>
<td>-.32*</td>
</tr>
<tr>
<td>2. Agreeableness</td>
<td></td>
<td>.22*</td>
<td>.46*</td>
<td>.44*</td>
<td>.35*</td>
<td>.33*</td>
<td>.14*</td>
<td>-.11*</td>
<td>-.31*</td>
</tr>
<tr>
<td>3. Need to belong</td>
<td></td>
<td></td>
<td>.16*</td>
<td>.21*</td>
<td>.12*</td>
<td>.16*</td>
<td>.28*</td>
<td>.12*</td>
<td>-.07</td>
</tr>
<tr>
<td>4. RNS</td>
<td></td>
<td></td>
<td>.81*</td>
<td>.51*</td>
<td>.49*</td>
<td>.25*</td>
<td>-.01</td>
<td>-.27*</td>
<td></td>
</tr>
<tr>
<td>5. Autonomy support</td>
<td></td>
<td></td>
<td></td>
<td>.49*</td>
<td>.49*</td>
<td>.22*</td>
<td>-.01</td>
<td>-.27*</td>
<td></td>
</tr>
<tr>
<td>6. Intrinsic regulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.87*</td>
<td>.53*</td>
<td>&lt;.01</td>
<td>-.32*</td>
<td></td>
</tr>
<tr>
<td>7. Identified regulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.57*</td>
<td>.06</td>
<td>-.30*</td>
<td></td>
</tr>
<tr>
<td>8. Introjected regulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.45*</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>9. External regulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.42*</td>
<td></td>
</tr>
<tr>
<td>10. Amotivation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. Relatedness support variable = composite score created by seven teacher behaviours (individualised conversation, task-related support, promoting cooperation and teamwork, teacher enthusiasm, teacher awareness, teacher care, and general friendly communication); RNS = relatedness need satisfactions; *p < .001.*
Table 3.4. *Study 2 aggregate-level correlations between relatedness supportive teacher behaviours and autonomy*

<table>
<thead>
<tr>
<th>Relatedness support subscale</th>
<th>Autonomy support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individualised conversation</td>
<td>.53</td>
</tr>
<tr>
<td>Task-related feedback</td>
<td>.60</td>
</tr>
<tr>
<td>Promoting cooperation and teamwork</td>
<td>.62</td>
</tr>
<tr>
<td>Teacher enthusiasm</td>
<td>.56</td>
</tr>
<tr>
<td>Teacher awareness</td>
<td>.66</td>
</tr>
<tr>
<td>Teacher care</td>
<td>.68</td>
</tr>
<tr>
<td>General friendly communication</td>
<td>.71</td>
</tr>
</tbody>
</table>

*Note.* All correlations significant at $p < .001$. 
Table 3.5. *Study 2 aggregate-level correlations between relatedness support dimensions*

<table>
<thead>
<tr>
<th>Relatedness support dimension</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Individualised conversation</td>
<td>-</td>
<td>.62</td>
<td>.53</td>
<td>.41</td>
<td>.57</td>
<td>.57</td>
<td>.56</td>
</tr>
<tr>
<td>2. Task-related feedback</td>
<td>-</td>
<td>.59</td>
<td>.50</td>
<td>.62</td>
<td>.60</td>
<td>.60</td>
<td></td>
</tr>
<tr>
<td>3. Promoting cooperation and teamwork</td>
<td>-</td>
<td>.51</td>
<td>.62</td>
<td>.66</td>
<td>.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Teacher enthusiasm</td>
<td>-</td>
<td></td>
<td>.53</td>
<td>.50</td>
<td>.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Teacher awareness</td>
<td>-</td>
<td></td>
<td></td>
<td>.74</td>
<td>.70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Teacher care</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. General friendly communication</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*Note.* All correlations significant at $p < .001$. 

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**Direct pathways.** Analyses revealed a number of significant direct effects (see Table 3.6). In line with recommended effect size criteria for path coefficients (i.e., .10 = small, .30 = moderate, .50 = large; Cohen, 1992), perceived relatedness support displayed a large positive association with relatedness need satisfaction. That is, students reported stronger relatedness need satisfaction regarding their teacher when they felt that their teacher engaged in relatedness-supportive (i.e., interpersonally-involving) behaviours. Perceptions of autonomy support provided by the teacher also positively predicted relatedness need satisfaction. It is worth noting that these effects upon relatedness need satisfaction occurred while accounting for students’ agreeableness and need to belong (which were not significant predictors). In addition to including agreeableness/need to belong as covariates in the path analysis, we also examined whether the putative covariates may alternatively act as potential moderators of the relationship between students' relatedness support and relatedness need satisfaction perceptions. We report in more detail on this alternative modeling strategy in Appendix C.
Table 3.6. *Standardised output for all structural and covariate pathways specified within the model*

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Estimate</th>
<th>SE</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Directional pathways</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relatedness support → RNS</td>
<td>.55</td>
<td>.062</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Autonomy support → RNS</td>
<td>.35</td>
<td>.062</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>RNS → Intrinsic regulation</td>
<td>.51</td>
<td>.058</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>RNS → Identified regulation</td>
<td>.49</td>
<td>.055</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>RNS → Introjected regulation</td>
<td>.25</td>
<td>.064</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>RNS → External regulation</td>
<td>-.01</td>
<td>.050</td>
<td>.871</td>
</tr>
<tr>
<td>RNS → Amotivation</td>
<td>-.27</td>
<td>.052</td>
<td>&lt;.001</td>
</tr>
<tr>
<td><strong>Covariate pathways</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agreeableness → RNS</td>
<td>.06</td>
<td>.032</td>
<td>.088</td>
</tr>
<tr>
<td>Need to belong → RNS</td>
<td>-.02</td>
<td>.025</td>
<td>.459</td>
</tr>
</tbody>
</table>

Note. Relatedness support variable = composite score created by seven teacher behaviours (individualised conversation, task-related support, promoting cooperation and teamwork, teacher enthusiasm, teacher awareness, teacher care, and general friendly communication). RNS = relatedness need satisfaction. Variance explained: RNS = 78%; Intrinsic regulation = 26%; Identified regulation = 24%; Introjected regulation = 6%; Amotivation = 8% (all p < .05); External regulation = <1% (p = .94).
Students’ relatedness need satisfaction was hypothesised to positively predict students’ intrinsic motivation and identified regulation for PE, while negatively predicting introjected regulation, external regulation and amotivation. Perceptions of relatedness need satisfaction displayed significant positive direct effects on intrinsic (a large effect) and identified (a moderate-to-large effect) regulations for PE. That is, students reported greater self-determined motives for PE (e.g., fun, enjoyment, value) when they felt supported, valued, and understood by their PE teacher. In terms of more controlled forms of motivation (i.e., introjected and external regulations), relatedness need satisfaction was not a significant predictor of external regulation; however, a small-to-moderate and positive effect was observed for relatedness need satisfaction in relation to introjected regulation. In other words, students reported greater introjection associated with their involvement in PE (i.e., guilt, worry, shame) when they perceived their PE teacher to be supportive, inclusive, and understanding. A significant, small-to-moderate negative effect was also found for students’ relatedness need satisfaction in relation to amotivation; that is, students reported greater amotivation for PE when they felt less supported, valued, and understood by their PE teacher.

**Indirect pathways.** We requested estimates of all possible indirect effects between students’ perceptions of relatedness support and each motivational regulation (via relatedness need satisfaction). For intrinsic motivation, we observed a significant pathway revealing a positive relationship linking students’ perceptions of relatedness support with their intrinsic motivation, via relatedness need satisfaction ($\beta = .28, SE = .05, p < .001$). We observed a similar positive indirect pathway linking students’ perceptions of relatedness support, relatedness need satisfaction, and identified regulation ($\beta = .27, SE = .05, p < .001$).
A significant positive pathway linking relatedness support and introjected regulation also emerged (i.e., relatedness support → relatedness need satisfaction → introjected regulation; $\beta = .14, SE = .04, p < .001$). Although no significant pathway was apparent for external regulation, a significant negative pathway was found linking relatedness support and amotivation via relatedness need satisfaction ($\beta = -.15, SE = .04, p < .001$).

**Discussion**

To date, researchers have demonstrated that students’ perceptions of a supportive and inclusive classroom – both within and beyond PE – are important in shaping positive in-class experiences (e.g., Cox et al., 2009; Wentzel, 1997). PE is characterised by frequent teacher-student interaction, and the quality of such interactions has been linked directly, and indirectly, to students’ self-determined motivation in PE (Gairns et al., 2015; Jackson et al., 2013). Recent work, however, has emphasised the need for further inquiry into the specific ‘signals’ that students use in forming their relatedness support appraisals (Standage & Emm, 2014; Van den Berghe et al., 2014). The aim of these studies, therefore, was to model a previously unexplored group of relatedness support indicators (i.e., perceptions of discrete teacher behaviours; Chapter II), and to determine whether this operationalisation of relatedness support predicted motivational outcomes in ways that would be expected on the basis of theory.

Guided by recent qualitative insight into the teacher behaviours deemed to be relatedness-supportive (Chapter II), we used existing and new instruments to quantify students’ perceptions on these behaviours. By way of confirmatory factor analysis, Study 1 focused on testing a second-order model comprising seven lower-order factors (i.e., perceptions on the relatedness-supportive teacher behaviours), which were proposed to load
onto a global relatedness support construct. Analyses provided support for a 7-factor, 35-item operational definition representing relatedness support and a network of indicators. Each discrete teacher behaviour latent variable loaded strongly onto a higher-order latent relatedness support variable, demonstrating that collectively these (perceived) behaviours were good indicators of relatedness support. To further examine this operationalisation, the aim of Study 2 was to again consider the loadings of all lower-order variables onto the higher-order construct, as well as to explore the direct and indirect relations between the higher-order construct and various theoretically-driven outcomes.

Using this method for modeling relatedness support, relationships between students’ perceived relatedness support, relatedness need satisfaction, and discrete motivational regulations for PE were examined. In line with study hypotheses and SDT (Deci & Ryan, 2000), the higher-order latent relatedness support variable displayed a positive, direct relationship with relatedness need satisfaction. This finding endorsed the utility of the strategy that we used to model relatedness support. Also included in the analysis, however, was a measure of autonomy support, hypothesised to also display direct relations to relatedness need satisfaction, given proposed interrelations among the three basic needs (Deci & Ryan, 2014). Notably, students’ perceptions of relatedness-supportive teacher practices – as per our modeling strategy – emerged as a stronger predictor of relatedness need satisfaction when estimated alongside perceptions of autonomy. It is important to note that while we initially included competence support in the analysis, problems emerged with the measure derived from our chosen instrument (i.e., the competence support items cross-loaded strongly onto the autonomy support latent variable, and loaded weakly onto their intended latent variable.), and for these reasons, we decided to remove the competence
support measure from subsequent analyses (see Appendix B). Future work should aim to
test relations between all three needs and relatedness need satisfaction. In addition, the
relationship between relatedness support and relatedness need satisfaction demonstrated a
large effect while also controlling for potentially relevant individual difference parameters
that may have independently accounted for students’ relational perceptions (i.e.,
agreeableness, need to belong). Given that these traits represent a lens through which
individuals view their interpersonal interactions (Baumeister & Leary, 1995; Jensen-
Campbell & Graziano, 2001), this finding suggests that the detection of supportive
behaviours from one’s teacher is able to satisfy students’ relatedness needs in PE
irrespective of (aspects of) their interpersonal style.

In addition to the direct structural pathways specified, a number of indirect relations
were proposed linking students’ interpersonal perceptions about their PE teacher and in-
class motivational outcomes via need satisfaction. Several indirect pathways were
observed; most notably, relatedness support indirectly predicted more self-determined
motives for PE (i.e., intrinsic motivation, identified regulation) through students’ need
satisfaction. In particular, when students felt that their PE teacher was relatedness-
supportive, they reported greater satisfaction of the need for relatedness, which in turn
aligned with more self-determined forms of motivation for PE. Aligning closely with
theory (Deci & Ryan, 2014), experiences of individualised care and attention, which
characterise relatedness-supportive interactions, linked with students’ experiences of
greater relatedness need satisfaction, thus creating the conditions that support more self-
determined motives in PE.
We observed several direct relationships between relatedness need satisfaction and students’ motivational regulations for PE. For both intrinsic motivation and identified regulation, positive direct effects were displayed, with the strongest pathway emerging between relatedness need satisfaction and intrinsic motivation. Contrary to our expectations, however, students also endorsed stronger introjected regulation (i.e., guilt, obligation, need to prove themselves) when they felt accepted and cared for by their teacher. One possible explanation for this finding is that the satisfaction of one’s relatedness need through connections with one’s teacher may induce perceptions of pressure to participate in PE and satisfy one’s teacher. Recent work by Cheung and Pomerantz (2012) has demonstrated, for example, that despite representing an introjected (i.e., more controlling) motive, the desire to please a socialisation figure can be an important motivating force to engage in an activity. Indeed, feeling closely connected to one’s teacher might catalyse to the desire to want to fulfill, and live up to, the teacher’s expectations during PE (Ryan & Deci, 2000). Thus, this perceived pressure might, in part, contribute to a heightened sense of introjection toward PE (e.g., feelings of guilt for not meeting perceived teacher expectations).

In reflecting on the contribution of this work, it is important to highlight implications of this study that serve to advance work in this field. First, this study offers a more detailed picture and operationalisation of relatedness-supportive practices in PE, as demonstrated in two relatively large samples. Considering how relatedness support has been measured previously in PE-based studies (see Standage et al., 2005), the range of instruments used in this work serve to encapsulate a novel, and more comprehensive, understanding of relatedness-supportive instruction in PE. From a practical standpoint,
these findings provide evidence for a set of discrete relatedness-supportive behaviours that may be utilised by PE teachers to facilitate positive in-class student outcomes. Given the value of teacher education and professional development aimed toward improving the quality of student-teacher interactions (Baroody, Rimm-Kaufman, Larsen, & Curby, 2014), practitioners and teachers may focus their attention on the development and training of strategies that display interest, warmth, and support within the PE classroom to foster favourable interpersonal perceptions among students. Results from this study also showed support for the predictive effects of our relatedness support model, alongside a range of relevant variables (e.g., autonomy support), as well as indirect links between relatedness-supportive teacher practices and important in-class outcomes (i.e., motivational regulations). Considering the novel method for modeling relatedness support that was adopted in this study, it is worthwhile to note the significant links between relatedness support, relatedness need satisfaction, and each of the separate motivational dimensions. To our knowledge, no PE-based study has specifically explored links between relatedness need satisfaction and motivational regulations while separately modeling each behavioural regulation.

It is important to consider the high correlations between perceived autonomy and relatedness support reported in this study. As outlined within SDT (Deci & Ryan, 2014), it is possible that strong positive relations may exist between the three basic needs, and generally high correlations have been found between individuals’ perceptions of the three distinct need support variables in previous work (Reinboth et al., 2004; Taylor & Ntoumanis, 2007). That being the case, although some degree of overlap between need support variables may be anticipated, it is worth cautioning that aspects of both autonomy
support and competence support may be embedded within the instructional practices that students deem to be relatedness-supportive. For example, encouragement and providing positive feedback have been identified as sources of competence supportive in previous work (Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008). It is entirely possible, given the strong correlations between autonomy and relatedness, that certain need-supportive practices may interchangeably satisfy more than one basic need, and consistent with this notion, existing work has demonstrated that autonomy and competence support can help satisfy one’s relatedness needs (Koka & Hagger, 2010; Taylor & Lonsdale, 2010).

Although the goal of this research was to – as best as possible – isolate relatedness-supportive teacher practices as identified by students, future work would be valuable in which redundancy and overlap between specific need supportive practices is examined.

Balanced against the strengths of this work, it is necessary to consider design limitations and accompanying future research directions. First, it is important to note that we obtained self-report measures from students at a single time point. In the future, it would be worthwhile incorporating more objective measures (e.g., observations, video) of specific teacher instructional practices that students believe to be relatedness-supportive in nature to further examine the degree to which teachers utilise these practices. As well, it would also be interesting to capture possible changes in students’ perceptions of teacher relatedness support across middle and high school years given the shift in school structure during a crucial stage of development (Reddy, Rhodes, & Mulhall, 2003). It is also important to discuss the imbalance between male and female participants in study 1. Commonly, tests of gender invariance may be conducted on such data, particularly as results from past classroom-based studies have shown relatedness to relate more strongly to
motivation for females than for males (Furrer & Skinner, 2003; Goodenow, 1993). Given the disproportionate amount of male participants in our sample, however, tests of invariance were not possible, and future work would benefit from conducting such analyses.

Alongside the support provided by their teachers, recent work has also begun to investigate the role that peers may play in supporting students’ relatedness needs (Cox et al., 2009; Gairns et al., 2015). Considering the importance that peer relations have throughout adolescence (see Brustad & Partridge, 1996), examining the interplay between different social agents is valuable, and research that adopts a holistic approach to examining caring, involving, and supportive classroom conditions that bolster student experiences is warranted. Finally, in terms of the measurement tool utilised for this study, it would be useful to closely examine item content. Considering the high correlations between relatedness support and autonomy support measures, and potential conceptual overlap with competence support, it may be worthwhile to seek to retain only those items that most clearly (conceptually and/or empirically) align with relatedness support from a SDT perspective.

Given that SDT (Deci & Ryan, 2000) is concerned with the social factors that may support or undermine self-determined motivation, our study focused on a set of novel, specific relatedness-supportive teacher behaviours as identified previously by students, and further examined the predictive nature of these behaviours with respect to motivational regulations for PE. Although our data do not allow for insight into causal relations between variables, this study highlights the importance of relatedness-supportive practices provided by the teacher in PE. Considering that the literature on relatedness-supportive practices in
PE is not yet fully developed, this study serves as an important foundation for intervention work designed to enhance the teacher provision of caring, warm, and interpersonally-involving classrooms that may foster adaptive student outcomes. Although student-teacher relationships and interactions within a classroom social system are multi-faceted and complex, the quality of such interactions requires careful attention so that we can better understand and encourage student engagement and motivation. Collectively, the set of relatedness-supportive behaviours (and associated modeling approach) presented in this study may offer practical strategies for teachers, and help to identify the attentive, caring, and supportive ‘signals’ that support students’ self-determined motivation within the PE classroom.
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*Journal of Sport & Exercise Psychology, 35*, 72-84.


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Chapter IV. An intervention to improve teachers’ interpersonally-involving instructional practices in high school physical education: Implications for student relatedness support and in-class experiences

Paper under review:
Chapter IV Foreword.

In Chapter III, I focused my attention towards the measurement of a distinct set of relatedness-supportive teacher behaviours (as identified by students in Chapter II), and set out to explore the ways in which students’ perceptions about their teacher directly and/or indirectly related to various in-class outcomes. With both Chapter II and Chapter III in mind, the aim of Chapter IV was to develop, implement, and evaluate a teacher training program grounded in Self-Determination Theory principles, geared towards increasing students’ in-class relatedness support perceptions and other pertinent outcomes.
Abstract

Research grounded in Self-Determination Theory (SDT; Deci & Ryan, 1985) has demonstrated the important role of teachers in shaping students’ physical education (PE) experiences. Utilising a cluster randomised controlled design, this study aimed to examine whether an interpersonally-involving training program based on SDT principles could enhance students’ in-class experiences. With 18 teachers (males = 8, females = 10, \( Mage = 32.75, SD = 8.14 \)) and a final sample of 382 students (males = 155, females = 227, \( Mage = 13.20, SD = 1.66 \)), we implemented linear mixed modeling analyses to investigate effects on students’ (a) perceived relatedness support, and (b) enjoyment of PE, tripartite efficacy beliefs (i.e., self-efficacy, other-efficacy, relation-inferred self-efficacy (RISE)), self-determined (relative to controlled) motivation, and amotivation. Relative to those in the control condition, students in the treatment condition reported positive changes in teacher-provided relatedness support, enjoyment, other-efficacy, and peer-focused RISE. These findings demonstrate support for strategies designed to aid PE teachers’ relatedness-supportive instructional behaviours.
Introduction

Regular participation in physical activity is important for healthy growth and development during adolescence (Ortega, Ruiz, Castillo, & Sjöström, 2008). It is well documented, however, that a large proportion of adolescents do not meet recommended physical activity guidelines (Tremblay et al., 2011), and as a result, researchers and policy makers have dedicated their efforts to exploring how physical activity may be better promoted in this population. One context that has received considerable attention in this respect is school-based physical education (PE; e.g., Lonsdale et al., 2013). Given that it is widely accessed by high school students, PE provides a formalised opportunity for adolescents to engage in a range of sports/physical activities, and studies in this area have shown that positive experiences in high school PE may align with better in-class engagement (e.g., Cox & Ullrich-French, 2010) and greater leisure-time physical activity (e.g., Chatzisarantis & Hagger, 2009). A sustained focus within PE-based research has been on the roles of key social agents (e.g., teachers) in shaping students’ PE motivation and experiences. With the goal of understanding how PE teachers may encourage student motivation and physical activity outcomes, much of the research within this body of literature has been guided by principles outlined within Self-Determination theory (SDT; Ryan & Deci, 2000).

SDT and Need Support

SDT is a theory of motivation concerned with supporting the natural or inherent tendencies of humans towards psychological growth and fulfillment. According to SDT, one’s motivation in a given context may vary according to a self-determination continuum, with autonomous motives at one end, and highly controlled motives at the other. Ryan and Deci (2000) theorised that autonomous (or self-determined) forms of motivation are
characterised by participation in an activity for reasons of fun, interest, enjoyment (termed ‘intrinsic motivation’), its consistency with one’s identity and sense of self (termed ‘integrated regulation’), and/or in light of the valued outcomes that it provides (termed ‘identified regulation’). On the other hand, more controlled forms of regulation reflect participation in an activity due to an external demand, reward, or punishment (termed ‘external regulation’), and/or in order to avoid self-imposed sanctions like shame or guilt (termed ‘introjected regulation’). Finally, individuals may also experience a lack or absence of motivation (termed ‘amotivation’). SDT also outlines that autonomous motivation is facilitated by the fulfillment of three basic psychological needs, namely autonomy (i.e., feeling like we are the initiators of our decisions and that our behaviours reflect our aims and choices), competence (i.e., feeling proficient to successfully carry out our pursuits), and relatedness (i.e., feeling that one is understood by, cared for, and connected to important others). Fulfillment of these needs is proposed to facilitate the internalisation of values and behaviours endorsed within a given setting (Deci & Ryan, 1985). Subsequently, ‘need-supportive’ environments that cater for these needs provide an environmental scaffold through which individuals experience need satisfaction, and in turn, relatively more self-determined forms of motivation. Based on this theoretical framework, PE-based studies have focused on the role of need-supportive teaching in facilitating students’ autonomous motivation, alongside other various desirable outcomes (e.g., engagement).

The Role of Need-Supportive Teaching

Given the importance ascribed to need support within SDT, much of the PE-based research has been directed toward investigating the role that teachers play in shaping student motivation. For example, research in this area has focused on teaching styles that are autonomy-supportive instead of controlling (e.g., Cheon et al., 2012), well-structured
and competence-facilitating instead of unorganised and critical (e.g., Mouratidis et al., 2008b), and emotionally-involved, interested, and connected instead of distant (Chapter II). Comprehensive reviews of this literature are available (Van den Berghe et al., 2014). Studies in this area have largely shown that environments that bolster students’ autonomy, competence, and relatedness needs are critical to supporting students’ self-determined motivation (Ntoumanis & Standage, 2009).

According to SDT, an autonomy-supportive teacher provides students with choice, considers their viewpoints, fosters understanding and interest toward learning, gives rationales, and encourages independent thinking (e.g., Assor & Kaplan, 2001; Reeve, 2002). Indeed, a significant amount of work has focused on conceptualising the characteristics of teacher autonomy support (see Su & Reeve, 2011), and empirical support exists for providing meaningful rationales, use of non-controlling language, offering choice, and providing challenging and stimulating activities as teacher behaviours that support students’ autonomy (Assor et al., 2002; Mouratidis et al., 2011; Reeve, 2006). In terms of fostering student competence and agency, teachers can support this need by providing structure. Structure relates to the provision of clear instruction surrounding classroom goals and expectations, offering help and guidance during learning activities, and giving constructive feedback to students after an activity (Koka & Hein, 2005; Sierens et al., 2009). Within educational settings, research grounded in SDT has mainly focused on the correlates of feedback, and has linked the provision of positive feedback to students’ self-determined motivation (Jang et al., 2009). Finally, to nurture students’ sense of relatedness, teachers can adopt an interpersonally-involving style by devoting time, effort, and energy to their students, encouraging cooperation and teamwork, supporting the emotional needs of their pupils, and by being friendly, warm, and receptive in their
interactions with students (Chapter II; Cox et al., 2009). Teacher involvement has been shown to be positively related to engagement in the classroom (Furrer & Skinner, 2003), as well as students’ self-determined motivation for PE (Chapter III; Cox et al., 2009; Gairns et al., 2015).

Given the empirical evidence demonstrating the value of need-supportive teaching, SDT researchers have begun to investigate whether autonomy-, competence-, and relatedness-supportive teaching practices can be augmented through training and professional development. Relative to observational investigations, though, there are fewer studies that have tested the malleability of teachers’ need-supportive instruction, and most of this work has been focused squarely on developing autonomy-supportive practices. In a meta-analysis reported by Su and Reeve (2011), the findings of 19 studies conducted across various domains demonstrated that the creation of an autonomy-supportive learning environment is plausible. However, this work examined the application of need support in various settings, and there are a limited number of studies that are specifically PE-based (see; Van den Berghe et al., 2014). In addition, existing intervention work in PE has largely been focused on autonomy-supportive and (to a lesser-extent) competence-supportive teaching. General findings from these studies have shown that trained teachers are able to adopt various autonomy- and competence-supportive behaviours in their PE classes, and that students of trained teachers have shown significant improvements in terms of their motivation and other important PE-based outcomes (Aelterman et al., 2014; Chatzisarantis & Hagger, 2009; Cheon et al., 2012; Tessier et al., 2008).

Guided by calls to focus more closely on the relational processes that underpin students’ motivation in PE (e.g., Standage & Emm, 2014; Van den Berghe et al., 2014), in Chapter II we examined specific teacher behaviours that students believed to be
relatedness-supportive. This work charted the array of instructional strategies and behaviours that are specifically deemed to be relatedness-supportive (as reported/determined by students themselves), and further empirical work (Chapter III) showed that teachers’ use of these relatedness-supportive practices was positively associated with student relatedness need satisfaction and self-determined motives for PE. These findings demonstrated that attentive, caring, and supportive teacher behaviours are important for students’ autonomous motivation, and identified the specific ‘signals’ that students use as markers of teacher relatedness support in high school PE. However, no existing intervention study in PE has specifically focused on training teachers’ ability to implement these relatedness-supportive strategies. Guided by SDT, our work conducted in Chapters II and III, and utilising a cluster randomised controlled design, the aim of this investigation was to implement a teacher training intervention focused on enhancing students’ perceptions of their teachers’ relatedness-supportive behaviours, and to evaluate its effectiveness by examining changes on other relevant in-class student outcomes.

**The Present Study**

Humans have an inherent propensity to seek out positive, stable, and emotionally-involved relationships with others (Baumeister & Leary, 1995), and within educational contexts, teachers are ideally placed to create positive social-emotional (i.e., relatedness-supportive) climates. In general education (i.e., non-PE) settings, positive and supportive student-teacher relationships have been shown to influence students’ sense of belonging (Connell & Wellborn, 1991), peer relations and academic self-efficacy (Hughes & Chen, 2011), and motivation in the classroom (Wentzel, 1997). Similarly, relatedness-supportive teaching within PE has been linked to better classroom engagement (Gairns et al., 2015), greater self-determined motivation, and greater leisure-time physical activity (Jackson et
al., 2013). Although there is relatively well-established information regarding the teacher practices that support students’ autonomy and competence, less is known about the specific strategies for increasing teachers’ interpersonally-involving practices in PE. The present study examined whether a professional development program targeting relatedness-supportive teaching – developed in line with SDT and empirical evidence presented in Chapters II and III – would lead to increases in students’ perceptions of relatedness support, relative to a no-training control arm.

The primary hypothesis was that students taught by the trained (i.e., treatment arm) teachers would, relative to controls, report more positive changes in their perceptions of relatedness support from baseline (i.e., pre-test) to follow-up (i.e., post-test) (Hypothesis 1). We also hypothesised that students under the trained teachers would, relative to controls, report more positive changes in secondary outcome variables, specifically PE enjoyment, self-efficacy (i.e., confidence in their ability in PE), other-efficacy (i.e., confidence in their teacher’s ability), relation-inferred self-efficacy (i.e., RISE; their estimation of their teacher’s and classmates’ confidence in their ability), and self-determined motivation for PE, as well as decreases in amotivation (Hypothesis 2). Student outcome measures – enjoyment, self-efficacy, other-efficacy, teacher- and peer-focused RISE, self-determined motivation, amotivation – were selected based on theoretical relevance (Deci & Ryan, 2000) and previous SDT research in PE contexts which has demonstrated associations between relatedness support and these variables (e.g., Jackson et al., 2013). Lastly, we aimed to determine whether students’ perceived relatedness support may act as a mechanism accounting for indirect relations between the independent variable (i.e., treatment condition) and the secondary outcomes (i.e., enjoyment, self-efficacy, other-efficacy, teacher- and peer-focused RISE, motivation).


**Method**

**Participants**

Students were required to be aged 11 to 15 years, and enrolled in PE class for the entire year at their respective schools to be eligible to participate. For teachers to be eligible, it was required that they had recognised teaching credentials (i.e., no student-teachers enrolled at college/university, or pre-service teachers, were eligible to participate). On the basis of an α of 0.05 and 80% power to detect a significant differential change in the primary outcome variable (i.e., relatedness support) between groups, using an effect size of $d = 0.60$ (Su & Reeve, 2011), and an anticipated intra-class correlation coefficient (ICC) of 0.10 (see Chapter III), a minimal sample of 61 students for each group was needed ($n = 122$). To protect against student attrition and preserve adequate statistical power, the sample size was inflated by 25%, thus a total of at least 153 students was required. Eighteen PE teachers (males = 8, females = 10, $Mage = 32.75$, $SD = 8.14$, range = 23-53) and 544 students (males = 269, females = 274, $Mage = 13.50$, $SD = 1.58$) from four different private Catholic high schools in Perth, Australia voluntarily agreed to participate in this study. Student participants were recruited from 22 different PE classes in grades 7, 8, 9 and 10. Class sizes ranged from 9 to 31 students per class, and teachers had an average of 9.97 years of teaching experience ($SD = 8.87$, range = 1-32). All participants took part in weekly compulsory PE, which was delivered across two or three class periods each lasting 50 minutes. The final student sample consisted of 382 students (males = 155, females = 227, $Mage = 13.20$, $SD = 1.66$) who completed both pre- and post-test measures (i.e., completers).
Procedures

After obtaining permission to conduct the study from the Human Research Ethics Board at the lead author’s institution, principals of 21 high schools were approached by telephone by the lead author to participate in the study. Four of these principals (19%) expressed interest in the study, and granted us permission to contact the head of PE at each institution. Appointments were subsequently made for the lead author to visit each school to provide the PE departments with information about the details of the study. All of the schools that expressed initial interest in the study agreed to participate, and these schools (and the PE teachers within them) were randomly assigned by the lead author using a cluster-randomisation method by simple random allocation (i.e., random-numbers table; Campbell, Elbourne, & Altman, 2004) to either the intervention \((n = 2\) schools, 11 PE teachers) or control condition \((n = 2\) schools, 11 PE teachers). Randomisation was conducted at the school level to decrease the risk of contamination (i.e., teachers informing other teachers about the training), and was carried out after pre-test measures were collected. All participants were informed that participation was voluntary, that all responses would remain confidential at all times, and that any party could withdraw from the study at any time. After obtaining informed consent from principals and teachers, parent/guardian information sheets were distributed, in which parents/guardians were informed of the nature of the study and were provided with a pre-paid return envelope should they wish to withdraw their child from the study ahead of data collection.

All participating PE teachers and their students were accessed on two measurement occasions (i.e., pre-test and post-test; see Figure 4.1 for schematic overview and timeline). Pre-test measures were conducted in August (i.e., midway through the school year), and post-test measures were collected in November. In September, only the teachers in the
intervention group participated in a 3-hr training session, whereas teachers in the control condition continued with their ongoing classroom activities. Teachers in the intervention group were offered ongoing email/telephone support, and the ability to ask questions/acquire feedback was made explicitly available to them by the lead investigator after the training session. In October, teachers in the intervention group were given two readings related to content (e.g., relatedness-supportive teacher practices) presented during the training session to enhance and/or maintain the goals of the intervention. Only teachers in schools assigned to the intervention condition were informed about the teacher training; teachers in the control condition were not informed of the training session until after the study was completed. Teachers in the control condition were initially informed that the aim of the research was to obtain assessments of student perceptions at two time points for the purpose of prospective (observational) analyses. Following the completion of the study, teachers in the control arm were provided with the opportunity to attend the 3-hr training session and with all information/support made previously available to those in the intervention arm.
Figure 4.1. *Overview of procedures and timeline of the intervention*

**Baseline**
- August 2015
- Intervention group: 10 teachers, 12 classes (188 students)
- Student measures:
  - Relatedness support
  - Enjoyment
  - Tripartite efficacy beliefs (i.e., self-efficacy, other-efficacy, teacher-RISE, and peer-RISE)
  - Motivation (i.e., intrinsic motivation, identified, introjected and external regulations, amotivation)

**Intervention**
- September 2015
- 3-hr training session on relatedness-supportive teaching

**Booster**
- October 2015
- No training
- Student measures:
  - Relatedness support
  - Enjoyment
  - Tripartite efficacy beliefs (i.e., self-efficacy, other-efficacy, teacher-RISE, and peer-RISE)
  - Motivation (i.e., intrinsic motivation, identified, introjected and external regulations, amotivation)

**Follow-up**
- November 2015
- Control group: 6 teachers, 10 classes (194 students)
- Student measures:
  - Knowledge of relatedness-supportive teaching

Teacher measure
- Knowledge of relatedness-supportive teaching
For both pre- and post-treatment measurements, appointments were made for a research assistant – blinded to both study hypotheses and group allocation – to visit each school to collect survey data. Before each PE session, 15 minutes was reserved for students to complete the surveys. All participants were asked to answer based on how they felt about PE and their PE teacher at that moment in time. The final study sample (i.e., those who provided complete pre- and post-treatment data) consisted of 10 PE teachers and their 188 students in the intervention group, and 8 PE teachers and their 194 students in the control group.

**Teacher training program**

A 3-hr training session was developed primarily using empirical evidence relating to relatedness-supportive PE teaching conducted in Chapters II and III of this thesis. To support teacher involvement and acceptance of the training, the session was directed toward giving participants the opportunity to reflect on their own teaching and build upon their existing good practices, as opposed to explicitly ‘changing’ their ‘bad’ practices (and behaviours). The training session consisted of three interactive parts: (1) theoretical background and introduction to need-supportive teaching, (2) introduction and overview of relatedness-supportive practices/strategies (as described in Chapter II) and how these relate to student motivation, and (3) active-learning (i.e., participatory) exercises.

Part 1 consisted of an introductory activity requiring small-group discussion, followed by an overview of the central tenets of SDT. Empirical evidence was provided to demonstrate the role of need support within PE and its relationship to student outcomes (i.e., engagement, motivation, physical activity). Autonomy and competence support were briefly mentioned as additional teaching strategies, but the teachers were made aware that
these methods would not be the primary focus of the session. Part 2 consisted of an introduction and overview of relatedness-supportive teaching strategies (see Chapter II). These strategies reflected the provision of individualised conversation demonstrating interest in each student, task-related support, promotion of cooperation and teamwork between students, teacher enthusiasm, awareness of students’ emotional states and classroom events, caring and supportive behaviours, and friendly communication with students, and were discussed in detail using real-life examples and video images (where available).

In part 3, each teacher was asked to describe the way in which s/he currently provided each of the relatedness-supportive behaviours in their PE classes. A group discussion was then held around new relatedness-supportive strategies that teachers felt they could feasibly implement into their instructional practices, as well as the potential challenges associated with such changes. This part of the training allowed for ample discussion, and several opportunities for self-reflection and peer feedback. Similar to work by Aelterman et al. (2014) and Hancox, Quested, Thøgersen-Ntoumani and Ntoumanis (2015), the actual training was delivered in a need-supportive way (by the lead author), giving teachers the opportunity to have their needs for autonomy, competence, and relatedness satisfied. For example, teachers were invited to introduce themselves and share their favourite teaching moments experienced with past students and colleagues. The trainer was careful to include each teacher’s viewpoint by leading a discussion aimed at the potential challenges faced during typical PE lessons (during which teachers themselves suggested practical strategies to their colleagues). The group discussions also allowed for teachers to provide positive feedback and helpful recommendations/strategies to one another. This method was consistent with previous recommendations for method of training.
delivery (Aelterman et al., 2013). At the end of the session, teachers were made aware that ongoing support throughout the program would be available, that questions were welcome at any time point, and feedback could be provided upon request. One month after the training session, teachers were provided with two “booster” readings on relatedness-supportive teaching, with the goal of reinforcing the information covered during the session.

**Measures**

**Student perceived relatedness support.** Given that the primary focus of the intervention was to promote relatedness support, we sought to utilise a sufficiently detailed instrument to measure students’ perceptions. Accordingly, a 35-item, seven-dimension instrument (presented in Chapter III) was employed. This measure is comprised of seven distinct relatedness support factors, namely individualised conversation (5 items; e.g., “My PE teacher asks me about my personal interests”), task-related support (6 items; e.g., “In my PE class my teacher instructs me frequently during PE”), promoting cooperation and teamwork (8 items; e.g., “My PE teacher allows us to talk about things we do in PE with classmates”), teacher enthusiasm (3 items; e.g., “My PE teacher is an enthusiastic teacher”), teacher awareness (4 items; e.g., “My PE teacher tries to help students who might be struggling”), teacher care (4 items; e.g., “Can you count on your PE teacher for help when you need it?”), and general friendly communication (5 items; e.g., “My PE teacher is easy to talk to about school things”). Detailed information on each dimension can be obtained by consulting Chapter II on the conceptualisation and measurement origins/development (Chapter III; Table 3.1). The use of a composite relatedness support score is empirically justified in Chapter III, and so for all analyses involving relatedness support, we created a global score by averaging the composite scores across all relatedness-supportive subscales.
Interested readers should see Appendix E for information relating to the unidimensional factor structure of the relatedness support measure (Table E1).

**Student enjoyment.** Students’ enjoyment in PE was assessed using a modified version of the sport enjoyment scale (Scanlan, Simons, Carpenter, Schmidt, & Keeler, 1993). The 4-item scale was modified to represent the school PE setting and students responded to items (e.g., “I like PE lessons” and “PE lessons make me happy”) on a five-point scale anchored at 1 (not at all true) and 5 (very true). Previous work with measures derived from this instrument has demonstrated evidence of internal consistency and factor validity (Scanlan et al., 1993).

**Student efficacy beliefs.** Students’ self-efficacy, other-efficacy, and (teacher- and peer-focused) RISE appraisals were assessed using the PE-specific instruments developed by Jackson, Whipp, Chua, Pengelley, and Beauchamp (2012). For self-efficacy, teacher-focused RISE, and peer-focused RISE, identical scales consisting of nine items were presented to students; however, the stem and instructions used for self-efficacy (i.e., “please honestly rate your confidence in your own ability at this moment in time to…”) and RISE (i.e., teacher-focused RISE: “please estimate how confident your PE teacher is in your ability at this moment to…”, peer-focused RISE: “please estimate how confident your fellow classmates are, as a whole, in your ability in PE at this moment in time to…”) differed in order to orient students toward the focal construct. Example items included “try your hardest in every PE class”, and “perform all the skills you are taught in PE”. To rate their confidence in their teacher’s ability (i.e., other-efficacy), students were asked to “please honestly rate your confidence in your PE teacher’s ability at this moment in time to…”. For example, students were asked to rate their confidence in their PE teacher to “motivate you even during hard or unfamiliar activities”. Students rated their efficacy
perceptions on a response scale ranging from 1 (no confidence at all) to 5 (complete competence). Total scores were calculated for students’ responses to self-efficacy, other-efficacy, and both RISE instruments, where higher scores reflected stronger PE-specific self-confidence, confidence in their PE teacher’s ability to teach PE (other-efficacy), and beliefs regarding how confident their PE teacher (teacher-focused RISE) was/classmates (peer-focused RISE) were in their own (i.e., the student’s) abilities. Jackson et al. (2012) reported evidence for internal consistency, factor, and criterion validity for measures derived from all three instruments among a sample of high school students, and additional work has demonstrated support for the internal consistency of measures derived from these instruments (Jackson et al., 2013).

**Student motivation.** To measure students’ motivational regulations for PE, we used the 20-item Perceived Locus of Causality (PLOC) questionnaire (Goudas et al. (1994). Preceded by the stem “I take part in PE classes”, the PLOC scale contains items assessing intrinsic motivation (four items, e.g., “because PE is exciting”), identified regulation (four items, e.g., “because I want to improve in sport”), introjected regulation (four items, e.g., “because I want the teacher to think I am a good student”), external regulation (four items, e.g., “because I’ll get in trouble if I don’t), and amotivation (four items, e.g., “but I don’t really know why). Students responded on a seven-point scale anchored at 1 (strongly disagree) and 7 (strongly agree). A composite relative autonomy index (RAI) – an index of self-determined motivation (RAI; Deci & Ryan, 2000; Ryan & Connell, 1989) – was calculated by assigning weights to intrinsic motivation (+2), identified regulation (+1), introjected regulation (-1), and extrinsic regulation (-2) scores. The RAI represents students’ level of self-determined (relative to controlled) motivation for PE, with positive scores reflecting relatively more autonomous motives and negative scores reflecting
relatively more controlled motives for PE. Unlike the separate modeling of each
behavioural regulation apparent in Chapter III, we decided to use the RAI to represent a
global index of self-determination to reduce the number of dependent variables. An
additional (separate) composite score was created for the construct of amotivation, with
higher scores reflecting greater levels of amotivation for PE. Recent investigations have
provided support for the reliability and validity of scores derived from the PLOC
instrument and the use of the RAI as a composite score (Jackson et al., 2013; Lonsdale et
al., 2011; Soenens & Vansteenkiste, 2005).

**Manipulation check.** In line with recommendations made by Beauchamp and
Morton (2011), we invited all teachers to respond to a series of multiple choice questions
about relatedness-supportive teaching during the follow-up assessment to determine
whether teachers’ knowledge of relatedness-supportive teaching in the intervention
condition was enhanced relative to those in the control condition. Teachers were asked to
“please answer the following questions about relatedness-supportive teaching to the best of
their ability”. For example, teachers were asked, “If a student feels relatedness-supported in
class, they may feel…”, (a) cared for, (b) a sense of belonging, (c) a social connection to
their teacher and/or peers, or (d) all of the above.

**Data Analysis**

**Data screening.** First, we screened for missing values, normality, and inspected for
univariate (i.e., standardised scores, $|z|\geq 3.30$) and multivariate outliers (i.e., Mahalanobis
distance at $p<.001$; Tabachnick & Fidell, 2007). Descriptive statistics were computed using
IBM SPSS Version 22. We computed estimates of internal consistency (Cronbach, 1951)
for all instruments/subscales and created composite scores by averaging the responses for
items per subscale. Initially, we conducted a three-way (2 x 2 x 2) between-groups
MANOVA with all primary baseline scores as dependent variables in order to (a) establish whether randomisation was successful, (b) determine whether differences existed on baseline variables between students who completed both pre- and post-test measures (i.e., completers), and students who completed only pre-test measures (i.e., dropouts), and (c) determine any baseline gender differences. Factors were treatment allocation (i.e., intervention vs control), participation status (i.e., completers vs. dropouts) and student gender (i.e., male vs. female). Finally, to ensure that the nature of the intervention was consistent with relatedness-supportive teaching, we conducted independent sample t tests to examine if teachers assigned to the intervention group versus control groups had better knowledge of relatedness-support (i.e., manipulation-check) following participation in the program.

**Main analysis.** To examine the effect of the teacher training on PE students’ perceptions of relatedness support, enjoyment, tripartite efficacy beliefs, self-determined motivation (i.e., RAI), and amotivation, we conducted linear mixed models using SPSS 22.0 (Chicago, IL, USA) because of the hierarchical structure of the data (i.e., students nested within classes). The fixed effects of treatment condition (intervention versus control) and time (pre-test versus post-test), random effects of classroom cluster (n = 22), and a condition-by-time interaction were assessed. We calculated effect size for the condition-by-time effect using methods proposed by Morris (2008), which are based on mean pre-post changes in the intervention group minus mean pre-post changes in the control group, divided by the pooled pretest standard deviation. Values of 0.2 (small), 0.5 (moderate), 0.8 (large) were used as guidelines for interpreting effect sizes (Cohen, 1992). For the main analyses reported in the manuscript, a per protocol approach was utilised, whereby students who provided baseline data but failed to complete post-treatment assessments were
excluded from analysis. The per protocol approach was selected given that the primary research goal was to determine the effect of the teacher training on students who received the “treatment” relative to the control condition (Ten Have et al., 2008). Specifically, teachers who led different classes on both occasions \(n = 2\), were not present on the training session day \(n = 1\), or had their contract terminated \(n = 1\), had their students excluded from this analysis. However, in light of dropout, we also performed an intention to treat analysis in which all student participants who provided baseline data were retained (irrespective of their participation in post-treatment assessment). In line with the ‘last observation carried forward’ principle, we carried forward baseline scores for those who did not provide post-treatment data in the intention to treat analysis (i.e., assuming no change over time). The results from this analysis can be found in the supplementary materials (see Appendix D), and are briefly reflected upon relative to our per protocol analyses in the discussion. Details and final participant numbers for are present in the flowchart in Figure 4.2.
Figure 4.2. Intervention flowchart

**Recruitment**
- Contacted for participation ($n = 21$ high schools)
  - Excluded ($n = 16$)
    - Not meeting inclusion criteria ($n = 1$); declined to participate ($n = 15$)
- Baseline measures ($n = 544$ students)
- Randomized ($n = 4$ schools; 22 PE teachers)

**Baseline**

**Allocation**
- Allocated to intervention ($n = 2$ schools; 11 PE teachers; 279 students)
  - Received intervention ($n = 10$ teachers); did not receive intervention ($n = 1$ teacher)
- Allocated to control ($n = 2$ schools; 11 PE teachers; 265 students)

**Follow-up**
- Absent during teacher training ($n = 1$ teacher); students absent at follow-up ($n = 71$)
- Teachers lost due to contract termination ($n = 1$); excluded due to different classes from pre- to post-tests ($n = 2$); students absent at follow-up ($n = 91$)

**Analysis**
- Analyzed ($n = 10$ teachers; 194 students)
- Analyzed ($n = 8$ teachers; 188 students)
Supplementary analysis. In addition to the main analyses, we conducted mediation analyses using Mplus Version 7.3. Should we observe a treatment effect upon relatedness support (i.e., our primary outcome), it was conceptually possible that any additional significant treatment effects on downstream (secondary) student outcomes (e.g., enjoyment, other-efficacy, RISE; Cox et al., 2009; Gairns et al., 2015) may have emerged at least in part due to an indirect effect through students’ relatedness support perceptions (e.g.,
treatment $\rightarrow$ relatedness support $\rightarrow$ enjoyment). Thus, when a significant condition-by-time interaction was found for enjoyment, any of the tripartite efficacy beliefs, and/or any of the motivational constructs measured (i.e., RAI, amotivation), we conducted an indirect analysis whereby these variables were entered as dependent variables (DV), treatment (coded as 1 for intervention and 0 for control) as the independent variable (IV), and relatedness support as the mediating variable (M). For this analysis, change scores were calculated for all DVs and relatedness support (e.g., pre-test scores for relatedness support were subtracted from post-test scores for relatedness support), with a positive value indicating that the students’ perceptions had increased from pre- to post-test (i.e., all variables were treated as observed variables and not using a latent modeling method).

Given that students were nested within classes, we implemented a “Type = Complex” correction for nonindependence of observations based on student clustering (Rabe-Hesketh & Skrondal, 2006). Missing data (which comprised 0.3% of all cases) were handled using the Mplus default full information maximum likelihood (FIML) approach, and we implemented maximum likelihood parameter estimates (MLR) with standard errors. In line with recommendations made by Kenny (2015) on mediation analyses, Bayesian Information Criteria (BIC) was utilised to determine the best fitting model between the
mediation model (i.e., saturated model; model with zero degrees of freedom), and models specified with no direct effects, no effect from IV→M, and no effect from M→DV.

Results

Descriptive statistics and data screening

Mean (and SE) scores for baseline and follow-up data for each student variable are displayed in Table 4.1, and reliability estimates (i.e., Cronbach’s α) ranged from .88 to .93. Subsequently, we examined whether there were pre-existing differences between intervention and control participants. The 2 x 2 x 2 between-groups MANOVA, which included all baseline measures as dependent variables, and treatment allocation (i.e., intervention vs control), participation status (i.e., completers vs. dropouts), and student gender (i.e., male vs female) as independent factors, revealed no significant main effects for treatment allocation (all ps>.05), participation status, or gender (all ps>.05), and no significant interaction effects between treatment allocation, participation status, and gender (all ps>.05), indicating that (a) random allocation was successful in creating similar groups of students, (b) students who completed both pre- and post-test measures and students who completed only pre-test measures were not significantly different, and (c) there were no baseline gender differences. We conducted independent sample t tests to examine if teachers assigned to the intervention group versus control groups had better knowledge of relatedness-supportive teaching (i.e., manipulation-check), and results indicated that teachers in the intervention group (M = .90, SD = .16) were significantly more knowledgeable about relatedness-supportive teaching than those in the control group (M = .46, SD = .09, t(16) = 4.57, p< .001) following participation in the training program.
Table 4.1. Mean scores and changes in student variables from baseline to follow-up.

<table>
<thead>
<tr>
<th>Measures</th>
<th>Baseline</th>
<th>Follow-up</th>
<th>∆ Change</th>
<th>Condition*Time</th>
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<tr>
<td></td>
<td>M</td>
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<td>SE</td>
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Note. SE = standard error; ∆ Change = post-test mean – pre-test mean; RAI = Relative Autonomy Index = (intrinsic motivation x 2) + (identified regulation x 1) + (introjected regulation x -1) + (external regulation x -2); *p < .05; **p < .01; d = effect size (Morris, 2008); n = 188 for intervention condition and n = 194 for control condition.
Intervention effects on student outcomes

Table 4.1 summarises the results of the linear mixed models for students’ perceptions of relatedness support, enjoyment, tripartite efficacy beliefs (i.e., self-efficacy, other-efficacy, teacher-focused RISE, and peer-focused RISE), RAI, and amotivation. In terms of our primary outcome, a significant condition-by-time interaction was found for students’ perceptions of relatedness support, $F(1, 380) = 9.72, p = .002, d = .62$. Separate one-way ANOVAs assessing change over time in each condition revealed a significant increase in relatedness support perceptions for those in the intervention group ($F(1, 187) = 10.48, p = .003, \eta^2_p = .25$), but no change for those in the control group ($F(1, 193) = 1.47, p = .258, \eta^2_p = .15$). A significant condition-by-time interaction was also found for enjoyment, $F(1, 380) = 6.59, p = .002, d = .36$. Subsequent one-way ANOVAs assessing change over time in each condition showed that students in the intervention condition reported significant increases in enjoyment of PE class ($F(1, 187) = 7.30, p = .009, \eta^2_p = .13$) compared to students in the control condition, where significant decreases in enjoyment were found ($F(1, 193) = 7.07, p = .025, \eta^2_p = .43$). In terms of the tripartite efficacy variables, significant condition-by-time interactions were found for both other-efficacy, $F(1, 380) = 6.50, p = .002, d = .40$ and peer-focused RISE, $F(1, 380) = 5.21, p = .002, d = .39$. One-way ANOVAs assessing change over time revealed that students of teachers who received the training reported increased confidence in their PE teacher’s abilities (i.e., other-efficacy; $F(1, 187) = 5.08, p = .031, \eta^2_p = .13$), and greater peer-focused RISE (i.e., estimations of their classmates’ confidence in their ability; $F(1, 187) = 5.73, p = .019, \eta^2_p = .07$), whereas students in the control condition reported no changes in other-efficacy and peer-focused RISE appraisals ($F(1, 193) = 3.46, p = .097, \eta^2_p = .29$ and $F(1, 193) = .45, p = .522, \eta^2_p = .05$, respectively). No significant interaction effects emerged for self-efficacy,
teacher-focused RISE, RAI, or amotivation. No significant main effects emerged for
treatment or time on any of the variables.

**Mediation analyses**

For each secondary outcome variable (‘DV’) that displayed a significant condition-
by-time interaction (i.e., enjoyment, other-efficacy, peer-focused RISE), we requested
estimates of the indirect effect between treatment condition (i.e., intervention or control)
and DV via relatedness support (‘M’). For each DV entered into a mediation analysis, the
BIC was utilised to determine the best fitting model between the mediation model (i.e.,
saturated model; model with zero degrees of freedom), and models specified with no direct
effects, no effect from IV → M, and no effect from M → DV. The model with the lowest
BIC was selected (Kenny, 2015), and in all analyses conducted, the mediation model was
the best fitting model. We observed significant pathways revealing positive indirect
relationships between treatment effect and enjoyment ($\beta = .16, SE = .06, p = .008$), other-
efficacy ($\beta = .22, SE = .08, p = .003$), and peer-focused RISE ($\beta = .11, SE = .04, p = .002$),
all via relatedness support. Taken together, these analyses revealed that the treatment
stimulated increases in students’ perceptions of relatedness support (our primary outcome),
which, in turn, aligned with more positive perceptions on a range of secondary outcomes
(i.e., enjoyment, confidence in the teacher’s ability, more favourable estimations of one’s
classmates’ confidence in one’s ability).

**Discussion**

Creating caring, inclusive, and understanding classrooms that support students’
need for relatedness is a relatively unexplored issue within the context of PE. Given that
most applied work in this area has focused on identifying (and to a lesser extent,
implementing) best-practice information associated with autonomy- and competence-
supportive environments, the purpose of this study was to implement and evaluate a PE teacher training program focused on enhancing students’ relatedness-support perceptions. More specifically, this study examined whether PE teachers could learn about, retain, and utilise relatedness-supportive practices in order to facilitate students’ in-class perceptions of relatedness support, and in turn, their enjoyment, tripartite efficacy beliefs, self-determined motivation (i.e., RAI), and amotivation.

**Intervention effectiveness and study findings**

In line with Hypothesis 1, the present study demonstrated the effectiveness of a training program concerning teachers’ use of relatedness-supportive strategies in PE. Teachers were shown to be more knowledgeable about relatedness-supportive instruction following the training, and as reported by students two months after the initial session, teachers in the intervention group became significantly more relatedness-supportive compared to those in a control condition. The condition-by-time interaction was characteristic of a moderate-to-large effect for students’ relatedness support, demonstrating the impact of the teacher training program. The results also partially supported Hypothesis 2, insofar as students in the intervention group (relative to those in the control group) reported higher levels of PE enjoyment, other-efficacy, and peer-focused RISE. Finally, analyses revealed support for indirect effects from treatment assignment to students’ PE enjoyment, other-efficacy, and peer-focused RISE estimations, via relatedness support. These findings not only extend previous work focused on relatedness support in PE (Chapter II and III; Cox et al., 2009), they also provide evidence for the feasibility and efficacy of strategies aimed at promoting the use of relatedness-supportive instructional behaviours among PE teachers. It is important to note that while findings from the intention to treat protocol were largely consistent with those observed using the per protocol
approach (see Appendix D), a condition-by-time interaction for peer-focused RISE was found to be non-significant while utilising intention to treat methods. The lack of this effect for the intention to treat analysis may be due to the retention of students who did not receive the intended treatment (e.g., students of teachers who changed classes/had their contract terminated).

In line with other need support work (Gairns et al., 2015), results from this study demonstrate the importance of interpersonally-involving practices, not only for shaping adaptive student outcomes (e.g., enjoyment), but also for interpersonal relations within the PE classroom. Significant condition-by-time interactions were found for both other-efficacy and peer-focused RISE perceptions, indicating that students who believed their teacher to be more relatedness-supportive also reported more confidence in their teacher’s abilities and more favourable estimations regarding the extent to which their classmates (as a whole) believed in their PE abilities. For high school students, early adolescent years are characterised by an increased focus on peers and social acceptance (Wentzel, Barry, & Caldwell, 2004), and research in the general education domain has linked positive peer relations to students’ academic success (Roseth, Johnson, & Johnson, 2008). Recent work in PE exploring the network of interpersonal appraisals held by students has also linked positive relations with peers to autonomous motivation in PE (Gairns et al., 2015; Jackson, Gucciardi, Lonsdale, Whipp, & Dimmock, 2014). Given the significance of students’ peer relations at school, and consistent with other educational literature (Mikami, Gregory, Allen, Pianta, & Lun, 2011), the results of this study indicate that quality student-teacher relations/interactions may help encourage more supportive, inclusive interactions between peers, which may in turn support more favourable peer-focused RISE appraisals.
One non-significant result that merits discussion is the non-significant condition-by-time interaction that we observed for self-determined motivation (i.e., the RAI). According to SDT (Deci & Ryan, 2000), need support should promote need fulfillment and underpin greater self-determined motivation. Thus, it was hypothesised that an increase in perceived relatedness-support (as provided by the teacher) would increase student’s self-determined motivation for PE. It appeared, though, that increases in relatedness support experienced by students were not strong enough to translate into desirable motivational changes using a RAI, which is consistent with other research findings (Lonsdale et al., 2013). Intrinsic motivation for PE reflects one’s interest in, as well as enjoyment of the class, and past work has demonstrated that these emotions, while often complementary, are conceptually distinct from one another (Reeve, 1989; Silvia, 2006). Silvia (2005) investigated the interest-enjoyment relationship and found that interest consists of appraisals of novelty, which can be triggered in more complex situations compared to feelings of enjoyment. Although increased relatedness-support (as provided by the teacher) accounted for improvements in students’ enjoyment of PE, it is possible that interest perceptions may have been harder to change as students were well-acquainted with their PE teacher and the sports/activities in which they were participating. Moreover, our teacher training methods were focused around helping students feel cared for and connected to their teacher, rather that providing students with fresh perspectives on how to appraise PE as ‘novel’. As feeling relatedness towards important others is fundamentally pleasurable, it is possible that the teacher training more closely targeted markers of enjoyment rather than interest. Concurrently, given that we measured students’ motivation, further work could include a relatedness need satisfaction measure to test the proposed relationship between need support, need satisfaction, and motivation as outlined by SDT (Deci & Ryan, 2000).
An alternative explanation for the significant enjoyment effect that was observed alongside the non-significant RAI effect is that past work has demonstrated links between relationships with socialising figures (i.e., teachers/parents) and heightened student/adolescent introjected regulations (Chapter III; Cheung & Pomerantz, 2012). It is plausible that stronger introjected regulation for a given activity (i.e., guilt, a desire to please an authority figure) may surface when feelings of acceptance, care, and support are derived from important others. In the case of this study, the perception of support and care from one’s teacher behaviour may have, to an extent, induced feelings of guilt and a desire to please one’s teacher in PE, and subsequently, any adaptive effects that the intervention had on autonomous motives for PE could have been washed out when examining overall RAI changes due to greater levels of introjection.1

Limitations, future directions, and conclusions

The present study is novel in that the intervention-based approach was exclusively focused on enhancing relatedness-supportive principles in the PE classroom. However, the per protocol approach had a final sample size of 18 teachers and 382 students, which is relatively modest. In order to obtain more robust evidence of its effectiveness, the intervention should be implemented on a larger scale, and over a longer period of time in order to assess long-term maintenance of any effects. In addition, considering the demographics of the schools participating (i.e., private Catholic schools), teachers and students in this sample were relatively restricted in terms of socioeconomic status (SES).

1 Results from additional analyses showed a significant interaction effect for introjected regulation which supports this claim. Additional analyses were conducted to examine the motivational regulations (i.e., intrinsic, identified, introjected, and external regulations) separately. Results for these analyses and a brief reflection can be found in the supplementary materials (see Appendix F. Motivational Regulations).
To help generalise study results, future intervention work in this area would benefit from considering public high schools in a broader range of (and particularly, lower) SES areas.

Our results point to the overall effectiveness of a training program concerning teachers’ use of relatedness-supportive strategies in PE; however, future intervention-based work may focus on specific design aspects to help increase the strength of the treatment and/or longevity of its effects. For example, a full-day or multiple-session training intervention (Hancox et al., 2015) may be more appropriate to increase the impact and internalisation of new information provided to teachers. Although we did include a follow-up (“booster”) activity supplementary to the training session, and made feedback and ongoing consultation available, a more interactive (and perhaps, more engaging) booster activity may be warranted. For example, providing interactive support to teachers via web-based content could help to improve the strength of treatment (Lonsdale et al., 2016; Wantland, Portillo, Holzemer, Slaughter, & McGhee, 2004). It is promising to see that the intervention displayed short-term positive effects on students’ perceptions; nevertheless, it remains to be seen whether teachers sustained these behaviours in the long-term, and if students continued to experience positive perceptions well after the intervention period. The inclusion of intensive follow-up activities, alongside post-training support might serve to facilitate the maintenance relatedness-supportive strategies after the training has concluded (Beauchamp et al., 2010), and further, additional follow-up measures could be administered to examine whether teachers are able to maintain relatedness-supportive practices over time.

Another limitation relates to the exclusive use of student self-report measures. Despite evidence for intervention effectiveness on our primary outcome, the implications of these results could be strengthened with data from teacher reports and externally-provided
observations of teacher behaviour. Recent PE-based work has demonstrated the effectiveness of adopting a multi-informant approach (Aelterman et al., 2014; Haerens et al., 2013), and obtaining information from multiple sources is important from the perspective of implementation fidelity (i.e., the degree to which an intervention is delivered as intended). Although the manipulation-check supported the fidelity of the treatment for those teachers receiving the training, the taking in of information is highly dependent on the motivation of participants to actively engage and make use of the strategies presented. Alongside student report measures, the addition of observer ratings and teacher reports would allow for greater convergence of information and further support for intervention effectiveness critical to future applications of relatedness-supportive teacher training.

The present study demonstrated the effects of an intervention program based on relatedness-supportive principles, and added to the extant SDT literature by focusing exclusively on PE teacher’s ability to be more warm, caring, inclusive, and supportive. Teachers were able to understand and implement relatedness-supportive strategies, and students of teachers in the intervention group found their teachers to be more relatedness-supportive.
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Chapter V. General Discussion
Chapter V Foreword

Chapter V is the final chapter of this thesis. Within this chapter, consideration is given to the key findings reported in the preceding chapters and the importance of this information as a whole. The chapter includes a summary of the work completed and detailed accounts of the implications of this work, general limitations, and subsequent research opportunities.
Research Summary

The purpose of the research presented within this thesis was to gain a better understanding of relatedness-supportive teaching within the context of PE. This work was based on the goal of identifying, measuring, and training the specific relatedness-supportive teacher practices that serve to support student motivation. In seeking to advance the literature in this area, in Chapter I we presented an overview of SDT (Deci & Ryan, 1985; Ryan & Deci, 2000), and reviewed pertinent research—both within and beyond PE— that has examined the role of the teacher in determining motivational dynamics within the classroom. Emphasis was directed toward studies utilising BNT (Deci & Ryan, 2000), and the motivational sequence as proposed by this mini-theory (i.e., need support → need satisfaction → types of motivation → behavioural/affective consequences). Particular attention was given to the psychological need for relatedness, how this psychological construct relates to student motivation, and the possible mechanisms through which teacher relatedness support links to adaptive student outcomes.

In order to address gaps in the SDT literature as outlined in Chapter I, Chapter II aimed to explore in detail the full range of specific teacher behaviours that high school students deem to be relatedness-supportive in PE. Through the use of semi-structured focus group interviews, themes that students identified as being highly relatedness-supportive emerged in relation to teacher communication, in-class social support, and behaviours associated with teacher attentiveness. Results also revealed the emergence of a number of salient affective (e.g., enjoyment) and behavioural (e.g., motivation) outcomes stemming from students’ perceptions of their teacher’s caring, supportive and helpful behaviours. These findings provided initial insight into a range of specific teacher behaviours that
students identify as relatedness-supportive, and emphasised the potential implications these behaviours might have for students’ experiences in PE.

The focus of Chapter III was to quantitatively measure the set of relatedness-supportive teacher behaviours as presented in Chapter II, and examine the relationships between these teacher practices, need satisfaction, and students’ motivation. Findings indicated support for a higher-order measurement model comprised of seven distinct relatedness-supportive teacher behaviours—individualised conversation, task-related support, cooperation and teamwork, enthusiasm, awareness, care, and general friendly communication—which provided a more detailed picture and operationalisation of relatedness-supportive practices in high school PE. In Chapter III, results also showed a number of direct and indirect relationships between teacher’s provision of relatedness support, relatedness need satisfaction, and students’ motivational regulations for PE, which were consistent with SDT.

Chapter IV extended findings from both Chapter II and III by focusing on the development, application, and evaluation of a teacher-training program based on relatedness-supportive practices. Findings demonstrated that PE teachers could learn about, retain, and utilise relatedness-supportive practices, which in turn facilitated students’ perceptions of relatedness support, as well as other positive student outcomes. Importantly, Chapter IV provided evidence for the feasibility and efficacy of strategies aimed at promoting the use of relatedness-supportive instructional behaviours among PE teachers.

**Implications**

In this thesis, the detailed investigation of relatedness-supportive teacher practices in PE provided important conceptual and practical implications. In this section, we draw from the findings reported in Chapters II through IV to elaborate on these implications.
**Conceptual implications.** In PE, the specific teacher instructional practices that students feel are supportive of their needs have received empirical attention (Chatzisarantis & Hagger, 2009; Cheon et al., 2012); importantly though, much of this work has focused on autonomy- and competence-supportive teacher practices, with less attention devoted to support for relatedness (Standage & Emm, 2014; Van den Berghe et al., 2014). This thesis presented a more intricate impression (than was previously available) regarding the specific teacher ‘signals’ that students believe to be ‘relatedness-supportive’, and how these teacher practices serve to facilitate adaptive student outcomes.

Through our qualitative investigation (Chapter II), students reported that feelings of relatedness support stemmed from PE teacher behaviours such as individualised conversation, teacher enthusiasm, friendly general communication, task-related support, promoting cooperation and teamwork, awareness, and caring behaviours—offering a more detailed conceptualisation and understanding of the warm, caring, and supportive behaviours that facilitate relatedness in PE. Previously, PE-based studies have often utilised a 5-item measure of relatedness support (see Standage et al., 2005; Standage et al., 2006), and findings from Chapter II provide a more detailed insight into the array of indicators of relatedness support. By way of existing and newly developed measures present in Chapter III, our results support the use of a 7-factor, 35-item operational definition representing the teacher practices that students themselves indicated to be a network of behaviours that are relatedness-supportive in PE. In sum, the range of instruments used in this work to represent relatedness support encapsulate a novel and more comprehensive understanding of relatedness-supportive instruction in PE.

**Practical implications.** The thesis findings indicate that relatedness support, as provided by the teacher, is an important motivational force within the PE classroom, and
both Chapter II and III demonstrate the predictive nature of relatedness support to positive student outcomes (e.g., relatedness need satisfaction, autonomous motives). As well, Chapter IV points to the potential effects of warm, caring, and supportive teaching to quality peer relations within the PE classroom. This information may be important for individuals and organisations (e.g., PE teachers, school boards) interested in promoting meaningful engagement in PE, which serves to promote future physical activity and sport endeavours outside of school. Given that PE is a setting where sport/physical activities are perhaps experienced for the first time, implementing relatedness-supportive teaching to ensure positive PE experiences may increase the likelihood of life-long physical activity participation.

The work presented in Chapter IV is an important foundation for future intervention work designed to enhance the teacher provision of caring, warm, and interpersonally-involving classrooms that may foster adaptive student outcomes. Results not only demonstrate support for the effectiveness of a training program designed to enhance PE teachers’ relatedness-supportive instructional behaviours, but findings also point to the adaptability and feasibility of PE teachers to internalise novel, evidence-based practices which may facilitate better student outcomes. Given that feeling meaningfully related to significant others is a basic human need (Baumeister & Leary, 1995; Ryan & Deci, 2000), the intervention work presented in this thesis represents an important practical resource for PE teachers, and educators alike, in terms of promoting quality student-teacher, and peer relations within their own classroom environments.

Limitations

Although this doctoral work was successful in addressing gaps in the SDT literature by exploring a range of relatedness-supportive teacher behaviours, and implementing a
theory-driven intervention to strengthen students’ perceptions of relatedness support in PE, this work is not without limitations. In terms of conceptual limitations, it is evident that our newly developed ‘definition’ of relatedness support shares some overlap with both autonomy and competence support. SDT theorists have outlined the plausibility of strong positive relations between the three basic needs (Deci & Ryan, 2014), and it is clear that aspects of both autonomy and competence support may be embedded within the instructional practices that students deem to be relatedness-supportive. Although the goal of this research was to – as best as possible – isolate relatedness-supportive teacher practices as identified by students, future work would be valuable in which redundancy and overlap between specific autonomy-, competence-, and relatedness-supportive practices is examined.

It is important to also highlight the reliance on self-report outcome measures within this thesis. Both Chapter III and IV relied heavily on the use of self-report measures, and in the future it would be worthwhile to incorporate more objective measures (e.g., observations, video) of specific teacher instructional practices that students believe to be relatedness-supportive to further examine the degree to which teachers utilise, and students benefit from, these practices. Furthermore, although a clearer picture of teacher-provided relatedness support in PE has been established through this work, without more objective measures/practical examples of interpersonally-involving teacher practice, and student outcomes (e.g., physical activity engagement) the implementation of relatedness-supportive teacher training in future work may be hindered.

The implications of the findings presented in this thesis are also limited to students’ experiences, and in the future, researchers should seek to obtain data from teachers themselves. Along these same lines, and from a practical standpoint, the addition of teacher
measures (both self-report and observational) would help address concerns relating to implementation fidelity (i.e., the degree to which an intervention is delivered as intended), as the taking in of information is highly dependent on the motivation of participants (i.e., teachers) to actively engage and make use of the strategies presented. As well, given the positive student outcomes found in Chapters II to IV, it would be equally beneficial to include measures of teacher experiences related to the participation in the training program to evaluate potential reciprocal effects resulting from the adherence of relatedness-supportive practices in the PE classroom (Reeve & Cheon, 2016).

Another limitation worth mentioning is the sampling methods (i.e., convenience sampling) used throughout Chapters II to IV. As certain schools in the Perth/Sydney area were more supportive of the research agenda, the results from this work are mainly based on data from students (and their teachers) attending independent private or Catholic schools, with participants drawn from a relatively consistent (moderate to high) socio-economic status (SES). Given the demographics of those attending the schools that participated in the work, our results are only generalisable to similar groups of students and teachers. For example, although Chapter IV results point to the overall effectiveness of a training program concerning teachers’ use of relatedness-supportive strategies in PE, teachers in rural, low socio-economic areas may be hard-pressed (e.g., be time poor, experience student backlash) when implementing such a program. Future intervention work should seek to extend these findings and evaluate the plausibility of relatedness-supportive teacher training by considering public high schools in a broader range of (and particularly, lower) SES areas.
Future Research

It is hoped that the work presented within this thesis leads to a better understanding of how PE teachers can create caring, inclusive, and supportive classroom environments that support students’ need for relatedness. That being said, there are future research opportunities that build upon the results of our work, and serve to advance the field and provide further insight into needs-based work.

**Moderators.** Although longitudinal and experimental work may add to a better understanding of relatedness-supportive teaching, as was explored (albeit briefly) in Appendix C, researchers should be mindful that there a number of factors that may influence the potential effects that were observed. Given that the social climate within PE classroom is multifaceted and complex, it is important for researchers to identify potential moderators that may influence the strength and direction of associations between relatedness-supportive practices, students’ relatedness needs, and various outcome variables. Specifically, our knowledge in this area may profit from researchers accounting for the potential influence of factors relating to the teacher, and students’ peer groups. For instance, examining the potential moderating effects of teacher burnout would be an interesting avenue to explore, inasmuch as students’ relatedness needs may be differentially satisfied by relatedness support, depending on the degree to which their teacher experiences emotional exhaustion, depersonalisation, and reduced personal accomplishment (Fernet, Guay, Senécal, & Austin, 2012). In terms of potential peer group effects, one could foresee, for example, the impact of peer athletic reputation. For example, Howle et al. (2016), have proposed that individuals might base their interaction decisions and behaviour (e.g., regarding cooperation, communication, attention, support, praise/derogation) on the reputational perceptions that they (and/or others) hold about specific peers' athletic
competence. Individuals who perceive that their peers hold a favourable athletic reputation about them may be more likely to experience greater relatedness need satisfaction than those students who believe their PE-based reputation is poor. Going forward, it would be of use to explore these potential teacher and peer group influences on students’ experiences of relatedness support and relatedness need satisfaction in PE.

**Physical activity outcomes.** In terms of outcomes, the work presented within this thesis focused on understanding links between students’ perceived relatedness support, students’ relatedness need satisfaction, and PE motivation. As relatedness support work in PE is still in its infancy, we felt it was important to document support for ‘in-class’ or ‘within-context’ effects first, before seeking to explore whether relatedness-supportive teaching might transfer to outside-class/cross-context outcomes. In the future, researchers could draw from the present findings to broaden the study of potential outcomes, and one avenue to consider would be the extension of this work to include downstream physical activity outcomes. A key issue in physical activity research is developing an understanding of the motivational forces underlying one’s engagement (or not) in a behaviour. As discussed in Chapter I, quality interpersonal interactions between individuals and their peers, coaches, teachers, and parents all help to shape the quality of their physical activity engagement and experiences (Standage & Emm, 2014). Given that the PE classroom is an ideal setting to promote physical activity and sport participation, future work examining the teacher provision of relatedness support would benefit from the inclusion of self-report and/or objective measures of students’ in-class engagement and leisure-time physical activity. Given that a plausible end-goal of PE-based research is to provide students with positive in-class experiences and promote life-long physical activity/sport participation, it
seems worthwhile to examine the extent to which warm, caring, and supportive teaching bolsters present and future participation in these activities.

**Intervention work.** The results presented in Chapter IV point to the effectiveness of a training program concerning teachers’ use of relatedness-supportive strategies in PE; however, future intervention-based work may focus on specific design aspects to help increase the strength of the treatment and/or longevity of its effects. To start, and in line with tenets of SDT (Deci & Ryan, 2000), it would be a worthwhile approach to include all three needs in future PE-based interventions. Very few PE-based studies have created a teacher training program involving aspects of all three needs, and given the complementary nature of the relations between autonomy, competence and relatedness (Deci & Ryan, 2014), students would likely benefit from their teacher’s participation in an ‘all-inclusive’ program.

Secondly, the teacher training program implemented was a 3-hr session, and a full-day or multiple-session training intervention may be more appropriate to increase the impact and internalisation of new information provided to teachers. It remains to be seen whether teachers sustained these behaviours over time, and if students continued to experience positive perceptions well after the intervention period. The inclusion of intensive follow-up activities, alongside post-training support might serve to facilitate the maintenance of relatedness-supportive strategies after the training has concluded (Beauchamp et al., 2010), and further, additional follow-up measures could be administered to examine whether teachers are able to maintain relatedness-supportive practices over time.
Summary and Conclusion

In Chapter I, a review of relevant work from both general and PE domains utilising a SDT framework was presented. In seeking to understand the ways in which students’ in-class perceptions and experiences are shaped, Chapter I focused on the role of the teacher in determining motivational dynamics within the classroom. From a SDT perspective, students’ basic psychological needs were emphasised within this Chapter, specifically the role of the teacher in providing classroom conditions that support students’ self-determination via need fulfillment. Given the overall goal of this thesis, special attention was given to the psychological need for relatedness, how this psychological construct relates to student motivation, the possible mechanisms through which teacher relatedness support links to adaptive student outcomes, and the gaps in the literature which we proposed to fill.

Chapter II focused on exploring the specific teacher behaviours that students deem to be relatedness-supportive in PE. Utilising qualitative techniques, semi-structured focused group interviews were conducted, and students were asked to identify behaviours which they believed to be relatedness-supportive (as provided by their teacher) in PE. Students identified seven discrete behaviours—individualised conversation, task-related support, cooperation and teamwork, enthusiasm, awareness, care, and general friendly communication—which they considered to be relatedness-supportive practices in PE. Students also identified a number of salient affective (e.g., enjoyment) and behavioural (e.g., motivation) outcomes stemming from their teacher displaying caring, supportive and helpful behaviours.

Building directly upon the findings from Chapter II, Chapter III sought to empirically measure the seven indicators of relatedness support as identified by students, as
well, examine several putative outcomes potentially associated to relatedness-supportive teaching. We tested a proposed higher-order relatedness support model, and explored the extent to which this relatedness support model predicted students’ relatedness need satisfaction and motivational regulations for PE. We found support for the higher-order relatedness support model and observed a number of predictive pathways. Students reported satisfaction of their need for relatedness when they felt relatedness support from their teachers, and students’ relatedness need satisfaction was in turn positively related to intrinsic, identified, and introjected regulations for PE.

Grounded in the conceptualisation and measurement outlined in Chapters II and III, Chapter IV focused on the development, application and evaluation of a PE teacher training program aimed at enhancing students’ relatedness support perceptions. Results from Chapter IV demonstrated the effectiveness of a training program concerning teachers’ use of relatedness-supportive strategies in PE. Teachers were shown to be more knowledgeable about relatedness-supportive instruction following the training, and as reported by students two months after the initial session, teachers in the intervention group became significantly more relatedness-supportive compared to those in a control condition.

Finally, in Chapter V, a review and critique of the information presented in Chapters I to IV was presented. A number of implications of the thesis findings were identified, particularly the conceptual, and practical issues related to our results. As well as considering limitations and applications of the thesis as a whole, future research was encouraged in relation to potential moderators of students’ relatedness need satisfaction, the inclusion of physical activity outcomes, and further needs-based intervention work.

This thesis contributes a novel and more comprehensive understanding of relatedness-supportive teaching in the context of PE. This work helped isolate the key
indicators of relatedness need support within the PE classroom, and results from this thesis provide important practical insight into need-supportive interpersonal climates. In addition to advancing our understanding of teacher practices that are relatedness-supportive, this work provides support for the use of a 7-factor, 35-item operational definition representing relatedness support and a network of indicators, which can be utilised (and refined) in future needs-based work. Finally, from a practical standpoint, the thesis findings demonstrated the effectiveness of an intervention program based on relatedness-supportive principles, and add to the extant SDT literature by focusing exclusively on PE teacher’s ability to be more warm, caring, inclusive, and supportive. Although the inferences from this thesis should be considered in light of its limitations, the novel understanding of relatedness-supportive teaching practices within the PE classroom holds promise in terms of better understanding students’ need satisfaction and motivation in PE.
References


Appendices
Appendix A. Chapter II Interview Guide

Today, we will be focusing on the concept of relatedness and how your PE teacher supports this feeling.

Relatedness

Being connected to, and experiencing caring for and from others

Feeling a sense of belonging

Feeling connected to others

Having close, nurturing, stable and safe relationships with other people

If you feel relatedness towards another person you:

- Feel like that person understands you
- Feel like that person cares about you
- Feel a sense of belonging
- Feel close and confident in your relationship with the other person
- Feel appreciated
- Feel like you can trust the other person
Thinking about this handout and the definition of “relatedness” you’ve been given, what are some things a teacher could do to make their students feel this way? I am now going to ask you a few questions about how your current or past PE teacher may or may not have made you feel this way.

Focus Group Interviews – Interview Guide

1. How does your PE teacher go out of their way to make you feel understood, cared for, valued, safe, trusted?
   a. Can be framed inside the classroom/outside the classroom

2. What sorts of actions or behaviours does your PE teacher demonstrate that make you feel good about yourself in PE? Make you feel supported in PE? Make you feel like you could go to them for advice if you had a problem/issue?

3. How does your PE teacher make an effort to “get to know you” as an individual OR take time to make you feel understood, cared for, valued, safe, trusted?
   a. Is there in an instance of this that stands out in your mind that you could share with the group?
   b. Can be framed inside/outside the classroom

4. What is something specific that your PE teacher has said or done inside/outside the classroom to make you feel like they care? Why was this important to you? How did it make you feel about your teacher? What impact did it have on you in your PE class?

5. How does your PE teacher provide you with individual attention in PE? Outside of PE?

6. Thinking about our discussion today, why do you think having a caring PE teacher is important? How does this impact on how you feel in PE? How does this impact on how you behave in class OR interact with others?
Appendix B. Chapter III Supplementary Material: Exploratory Structural Equation Model

As a supplement to our primary Chapter III, Study 2 analyses, we employed an exploratory structural equation modeling (ESEM; Asparouhov & Muthén, 2009) technique allowing for approximate zero cross-loadings between relatedness support, autonomy support, and competence support indicators with respect to their non-intended latent variables. This analysis was conducted on the basis of the high correlations initially observed between relatedness support, autonomy support, and competence support latent variables, and other relevant literature reporting similar findings (Koka & Hagger, 2010; Taylor & Lonsdale, 2010). The aim of this ESEM was primarily to determine if the 35 relatedness support items loaded primarily (and meaningfully) onto their intended (higher order) latent variable (i.e., relatedness support), and to examine cross-loadings onto the other variables (i.e., autonomy support and competence support). When interpreting the strength of factor loadings, we utilised Comrey and Lee’s (1992) recommendations (i.e., >.55 = good, .45-.55 = fair, .32-.45 = poor, <.32 = should not be interpreted). Fit indices indicated that the model was initially a marginal fit to the data (Tabachnick & Fidell, 2007), $\chi^2 (639) = 1845.10, p < .001$, CFI = .91, TLI = .87, SRMR = .035, RMSEA = .057, (90% CI: .054, .060). Although all relatedness support items loaded primarily and meaningfully onto their intended latent variable (and not meaningfully onto either of the other latent variables), there appeared to be several loading problems with the competence support indicators (i.e., items cross-loaded strongly onto the autonomy support latent variable and weakly onto their intended latent variable). For this reason, the competence support measure was removed from all subsequent analyses. An additional ESEM was subsequently performed with only the relatedness support and autonomy support items, and
fit indices indicated the model was an acceptable fit to the data $\chi^2 (388) = 1371.85, p < .001, \text{CFI} = .93, \text{TLI} = .92, \text{SRMR} = .04, \text{RMSEA} = .06, (90\% \text{ CI: } .06, .07)$. Standardised factor loadings for relatedness support ranged from .45 to .94 (see Table S3). Based on cut-off recommendations (i.e., >.55 = good, .45-.55 = fair, .32-.45 = poor, <.32 = should not be interpreted; Comrey & Lee, 1992), all relatedness support items had significant intended loadings ranging from fair to good, and displayed cross-loadings that were either not meaningful or were marginal (but not as strong as their primary loading) on the autonomy support latent variable. Overall, the ESEM analysis appeared to generally support the notion that all relatedness support items loaded primarily, significantly, and meaningfully onto their intended latent variable, and that these indicators formed a substantively different sub-set of items from the autonomy support indicators.
Table B1. *Chapter II, Study 2 EFA rotated factor loadings and descriptive information*

<table>
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<tr>
<th>Subscale and item</th>
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<td>Relatedness support</td>
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**Autonomy support**

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*Note. IC = Individualised conversation, TS = Task-related support, PC = Promoting cooperation and teamwork, TE = Teacher enthusiasm, TA = Teacher awareness, TC = Teacher care, GFC = General friendly communication, AS = Autonomy support.*
References


Appendix C. Chapter III Supplementary Material: Moderator Analysis

Supplementary to the path analysis conducted in Chapter III, Study 2, and following the suggestion of an anonymous reviewer, we examined whether the putative covariates modeled in the main analysis may actually (alternatively) act as potential moderators of the relationship between students’ relatedness support and relatedness need satisfaction perceptions. In line with recent work by De Meyer et al. (2016), we sought to examine the proposition that students’ relatedness needs may be differentially satisfied by relatedness support, depending on their need to belong and/or agreeableness. Agreeableness reflects a person’s tendency to be kind, cooperative, altruistic, trustworthy, and generous (Graziano & Tobin, 2002), and need to belong reflects the inherent human desire to seek out positive, stable, and emotionally involved relationships with others (Baumeister & Leary, 1995).

For example, students with a strong need to belong and/or strong motive to maintain relationships with others (i.e., agreeableness) may seek out a large number of relationships, worry about how they are valued by others, and put a great deal of effort into sustaining their relationships. Given that individuals differ in these interpersonal orientations, we (and an anonymous reviewer) felt it might be possible that – as opposed to directly predicting individuals’ relational appraisals (see main analysis) – agreeableness and need to belong may alter (i.e., moderate) the extent to which students’ relatedness needs are satisfied when they experience a relatedness-supportive teacher. It might be argued, for instance, that feeling one has a highly relatedness-supportive teacher may be less significant for those who feel relatively little need to belong (e.g., “my teacher supports me, but I don’t care too much about that sort of thing, so I don’t feel too close to, or connected with, him/her”).

To examine the potential moderating effects of agreeableness and need to belong on the relationship between relatedness support and relatedness need satisfaction, we followed
existing recommendations for estimating latent variable interactions in Mplus (Maslowsky, Jager, & Hemken, 2014; Muthén, 2012). An estimation procedure for latent moderated structural equations (LMS; Klein & Moosbrugger, 2000) using the XWITH command in Mplus Version 7.3 (Muthén & Muthén, 1998-2014) was utilised separately for each of the potential moderators. With the exception of the moderator pathways (in place of the covariate pathways), the models specified were exactly the same as the model displayed in the main figure (see Figure 3.2). Non-significant results were found for both agreeableness ($\beta = -.09, SE = .08, p = .31$) and need to belong ($\beta = .02, SE = .09, p = .86$); therefore, further methods assessing LMS model fit (i.e., CFI, TFI, standardised beta coefficient, effect size of the interaction effect, and interpreting the interaction) were not conducted. Together, these findings suggest that the moderating role of students’ agreeableness and need to belong on the relationship between relatedness support and relatedness satisfaction – in this instance, at least – is limited. Future research assessing the relatedness support perceptions, however, may provide a more intricate examination of how individual differences contribute to variations in need support-to-need satisfaction relationships.
References


Appendix D. Chapter IV Intention to Treat Protocol: Intervention effects on Student Outcomes

To supplement the ‘per protocol’ procedure reported in the main manuscript, an intention to treat method was also applied (N = 544), in which all participants – including those lost to follow up – were retained for analyses. We employed the ‘last observation carried forward’ method to replace missing data for participants who did not complete follow-up measures (n = 162). Linear mixed models were conducted for students’ perceptions of relatedness support, enjoyment, tripartite efficacy beliefs (i.e., self-efficacy, other-efficacy, teacher-RISE, and peer-RISE), RAI, and amotivation. In terms of our primary outcome, and consistent with the per protocol approach, a significant condition-by-time interaction emerged for students’ perceptions of relatedness support, $F(1, 542) = 7.27, p = .007, d = .54$. Separate one-way ANOVAs assessing change over time in each condition revealed a significant increase in relatedness support perceptions for those in the intervention group ($F(1, 276) = 9.08, p = .005, \eta^2_p = .20$), but no change for those in the control group ($F(1, 264) = 1.98, p = .185, \eta^2_p = .15$). A significant condition-by-time interaction was also found for enjoyment, $F(1, 542) = 4.61, p = .032, d = .36$. Subsequent one-way ANOVAs assessing change over time in each condition showed that students in the intervention condition reported significant increases in enjoyment of PE class $F(1, 276) = 4.46, p = .039, \eta^2_p = .10$, compared to students in the control condition, where significant decreases in enjoyment were found ($F(1, 264) = 10.80, p = .005, \eta^2_p = .41$). In terms of the tripartite efficacy variables, a significant condition-by-time interaction was found for other-efficacy, $F(1, 542) = 4.54, p = .030, d = .40$. One-way AOVAs assessing change over time revealed that students of teachers who received the training reported increased confidence in their PE teacher’s abilities ($F(1, 276) = 3.12, p = .043, \eta^2_p = .09$),
whereas students in the control condition reported no changes in other-efficacy ($F(1, 266) = 4.13, p = .065, \eta^2_{p} = .25$). No significant interaction effects emerged for self-efficacy, teacher-RISE, peer-focused RISE, RAI, or amotivation. No significant main effects emerged for treatment or time on any of the variables. Findings from the intention to treat protocol were largely consistent with those observed using the per protocol approach.
Appendix E. Chapter IV Principal Component Analysis

Prior to conducting our primary analyses, we employed a principal component analysis (PCA) to establish that the relatedness support subscales loaded meaningfully onto a single higher-order (i.e., relatedness support) factor. When interpreting the strength of factor loadings, we utilized Comrey and Lee’s (1992) recommendations (i.e., >.55 = good, .45-.55 = fair, .32-.45 = poor, <.32 = should not be interpreted). We calculated aggregate scores for each of the 7 subscale/dimensions in SPSS. Using retention criteria of eigenvalues > 1.0, the initial solution revealed that all relatedness support dimensions loaded meaningfully onto a single factor, reflecting a unitary construct and explaining 69.1% of the variance (see Table E1). Correlations among the extracted factors are presented in Table S1 Overall, the PCA analysis appeared to support the notion that all relatedness support dimensions loaded meaningfully onto a single construct.
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*Note. All correlations significant at $p < .001$*
References

Appendix F. Chapter IV Motivational Regulations

Analysis. To examine the effect of the teacher training on PE students’ motivational regulations (i.e., intrinsic, identified, introjected, external) we conducted linear mixed models using SPSS 22.0 (Chicago, IL, USA) because of the hierarchical structure of the data (i.e., students nested within classes). The fixed effects of treatment condition (intervention versus control) and time (pre-test versus post-test), random effects of classroom cluster \(n = 22\), and a condition-by-time interaction were assessed. We calculated effect size for the condition-by-time effect using methods proposed by Morris (2008), which are based on mean pre-post changes in the intervention group minus mean pre-post changes in the control group, divided by the pooled pretest standard deviation. Values of 0.2 (small), 0.5 (moderate), 0.8 (large) were used as guidelines for interpreting effect sizes (Cohen, 1992). For the main analyses, a per protocol approach was utilized, whereby students who provided baseline data but failed to complete post-treatment assessments were excluded from analysis. The per protocol approach was selected given that the primary research goal was to determine the effect of the teacher training on students who received the “treatment” relative to the control condition (Ten Have et al., 2008). Specifically, teachers who led different classes on both occasions \(n = 2\), were not present on the training session day \(n = 1\), or had their contract terminated \(n = 1\), had their students excluded from this analysis. However, in light of dropout, we also performed an intention to treat analysis (as per our approach with our primary analyses) in which all student participants who provided baseline data were retained (irrespective of their participation in post-treatment assessment). To supplement the ‘per protocol’ procedure reported in the main manuscript, therefore, an intention to treat method was also applied \(N = 544\), in which all participants – including those lost to follow up – were retained for
analyses. We employed the ‘last observation carried forward’ method to replace missing data for participants who did not complete follow-up measures ($n = 162$).

**Results.** Table F1 summarizes the results of the linear mixed models for students’ motivational orientations using the per-protocol approach. A significant condition-by-time interaction was apparent for introjected regulation, $F(1, 380) = 7.66, p = .006, d = .246$. Inspection of the means (see Table F1) for both intervention and control conditions showed that students assigned to the intervention group reported significant increases in their introjected regulation for PE compared to the control group. One-way ANOVAs assessing change over time revealed that students of teachers who received the training reported increased introjected regulation for PE ($F(1, 187) = 7.50, p = .01, \eta^2_p = .02$), whereas students in the control condition reported no changes in their introjected regulation ($F(1, 193) = 1.15, p = .28, \eta^2_p = .003$). No significant interaction effects emerged for intrinsic, identified, or external regulation. No significant main effects emerged for treatment or time on any of the variables.

Utilizing the alternative intention to treat method, linear mixed models were again conducted for students’ motivational regulations (i.e., intrinsic motivation, identified, introjected, external regulation). In terms of significant interactions, and consistent with the per-protocol approach, a significant condition-by-time interaction emerged for students’ perceptions of introjected regulation, $F(1, 542) = 6.43, p = .001, d = .211$. Separate one-way ANOVAs assessing change over time in each condition revealed a significant increase in introjected regulation for those in the intervention group ($F(1, 276) = 8.17, p = .012, \eta^2_p = .18$), but no change for those in the control group ($F(1, 264) = 2.02, p = .243, \eta^2_p = .15$). No significant interaction effects emerged for intrinsic, identified, or external regulation. No significant main effects emerged for treatment or time on any of the variables. Findings
from the intention to treat protocol were, therefore, consistent with those observed using the per protocol approach.

**Discussion.** Although no significant condition-by-time interaction was found for students’ intrinsic motivation, identified regulation, or external regulation for PE, a significant interaction effect emerged for students’ introjected regulations. This condition-by-time interaction for introjected regulation – whereby students of teachers in the intervention group reported higher levels of introjection at follow-up compared to students in the control group – was contrary to our hypotheses. That said, findings that support this effect have recently been presented. Specifically Sparks, Dimmock, Lonsdale, and Jackson (2016) demonstrated that students’ perceptions of relatedness support provided by their teacher were positively related to their introjected regulations for PE. It is possible, therefore, that external pressures to participate in PE (e.g., guilt) may be induced in instances when teachers are caring, supportive, and involving in their instruction and interactions with students. Recent work by Cheung and Pomerantz (2012) has demonstrated, for example, that despite representing an introjected (i.e., more controlling) motive, the desire to please a socialization figure and gain social approval can be an important motivating force to engage in an activity, which is especially prominent throughout the adolescent years. Indeed, feeling closely connected to one’s teacher might catalyze the desire to want to fulfill, and live up to, the teacher’s expectations during PE (Ryan & Deci, 2000). Accordingly, introjected regulation may represent the beginnings of internalization (i.e., the taking in) of physical activity behaviors introduced by one’s teacher. Given that there is a controlling aspect to all PE participation in high school (i.e., mandatory participation), external pressures imposed by various social agents may be critical supports of developing health.
Table F1. *Mean scores and changes in student motivation from baseline to follow-up.*

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*Note.* Statistical outputs based on the per protocol analytic method. SE = standard error; Δ Change = post-test mean – pre-test mean; *p < .05; **p < .01; d = effect size (Morris, 2008); n = 272 for intervention condition and n = 272 for control condition.
References


