

**THE ROLE OF PERCEIVED TEACHER
FEEDBACK AND PERCEIVED LEARNING
ENVIRONMENT ON INTRINSIC
MOTIVATION IN PHYSICAL EDUCATION**

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CONTENTS

LIST OF ORIGINAL PUBLICATIONS	7
1. INTRODUCTION.....	8
2. REVIEW OF LITERATURE.....	10
2.1. Theoretical framework	10
2.2. Motivation in sport and exercise	10
2.2.1. Different motivational orientations in sport and exercise	11
2.3. Measuring motivation in sport and exercise.....	13
2.3.1. Intrinsic Motivation Inventory	13
2.3.2. Sport Motivation Scale.....	14
2.4. Feedback in the teaching-learning process.....	16
2.4.1. The feedback as a source of perceived competence and intrinsic motivation in sport and exercise.....	16
2.5. The importance of learners' perceptions in the teaching-learning process.....	18
2.6. Measuring the perceived feedback types in sport.....	19
2.6.1. The relationship between perceived feedback and intrinsic motivation in sport.....	21
2.7. Perceived learning environment and intrinsic motivation in school physical education	23
2.8. Leisure-time sport participation as a factor influencing students' perceptions and intrinsic motivation in physical education	25
2.9. Unresolved issues	26
3. OBJECTIVES OF THE PRESENT STUDY	29
4. METHODS.....	30
4.1. Participants	30
4.2. Measures.....	31
4.3. Procedure.....	34
4.4. Statistical analysis	34
5. RESULTS.....	36
5.1. Perceived teacher's feedback, dimensions of perceived learning en- vironment, and intrinsic motivation in physical education (Paper I) .	36
5.2. The effect of leisure-time sport participation on perceived teacher feedback, perceived learning environment, and intrinsic motivation in physical education (Paper II).....	37
5.3. Revision and extension of the Perception of the Teacher's Feedback (PTF) (Paper III).....	38

5.4. The effect of both perceived verbal and nonverbal teacher feedback on intrinsic motivation in physical education (Paper III).....	40
5.5. Stability and causal nature of perceived positive general feedback and perceived threat to sense of self in physical education over a two-year period (Paper IV).....	43
6. DISCUSSION	46
6.1. Validity and reliability of the measures (Paper I, III)	46
6.1.1. Perception of the Teacher’s Feedback (PTF)	46
6.1.2. Physical Education Learning Environment Scale (PELES).....	47
6.2. Relationships between perceived teacher feedback and intrinsic motivation (Paper I, III)	48
6.3. Relationships between perceived learning environment and intrinsic motivation (Paper I)	50
6.4. The effect of leisure-time sport participation on perceived teacher feedback, perceived learning environment, and intrinsic motivation in physical education (Paper II).....	51
6.5. Stability and causal nature of perceived positive general feedback and perceived threat to sense of self in physical education over a two-year period (Paper IV).....	52
6.6. Limitations of the study.....	54
7. CONCLUSIONS	56
8. REFERENCES	57
SUMMARY IN ESTONIAN	65
ACKNOWLEDGEMENTS	67
PUBLICATIONS	69

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the papers listed below, which will be referred to in the following by their Roman numerals:

- I. Koka, A., Hein, V. (2003). Perceptions of teacher's feedback and learning environment as predictors of intrinsic motivation in physical education. *Psychology of Sport and Exercise*, 4(4), 333–346.
- II. Koka, A., Hein, V. (2003). The impact of sports participation after school on intrinsic motivation and perceived learning environment in secondary school physical education. *Kinesiology*, 35(1), 5–13.
- III. Koka, A., Hein, V. (2005). The effect of perceived teacher feedback on intrinsic motivation in physical education. *International Journal of Sport Psychology*, 36(2), 91–106.
- IV. Koka, A., Hein, V. (in press). Perceptions of teacher's positive feedback and perceived threat to sense of self in physical education: a longitudinal study. *European Physical Education Review*.

1. INTRODUCTION

A theoretical framework that has been frequently used to study intrinsic motivation in sport and exercise settings is cognitive evaluation theory (Deci & Ryan, 1985; Ryan & Deci, 2000). Studies in sport domain have supported the basic tenets of the theory and indicated that athletes' perceptions of coaches' positive and informational feedback should lead to the increase in perceived competence, which in turn increases intrinsic motivation. Perceptions of the negative feedback, on the other hand, provide negative competence information, which should lead to a decrease in intrinsic motivation (Allen & Howe, 1998; Amorose & Horn, 2000, 2001; Black & Weiss, 1992; Hollebeak & Amorose, 2005). However, the relationship between perceptions of the teacher feedback and students' perceived competence and intrinsic motivation in a school physical education setting is not clear.

The importance of physical education in contemporary school education is now recognised worldwide. School physical education has been considered to be a context in which health enhancement, via the fostering of physical activity, may be achieved and extended because physical education classes contain virtually all children (Haywood, 1991; Sallis et al., 1992). Therefore, it is important that children are appropriately motivated to participate in physical education lessons. Although, the importance of feedback from parents, teachers, and coaches in facilitating young people's intrinsic motivation has been recognized in achievement settings (Ames, 1992; Deci & Ryan, 1985, 2000; Harter, 1978, 1981, 1998), a number of questions remain unanswered. According to Lee et al. (1999), the effectiveness of teacher practice in physical education will depend on how it is perceived and interpreted by the learner. However, research conducted so far in the area of perceptions of learning environment in physical education has not dealt with the students' perceptions of feedback provided by the teacher and its impact on intrinsic motivation. The dearth of such research may also be attributed to absence of valid and reliable psychometric tools to assess students' perceptions of the teacher's feedback in physical education.

Therefore, one of the main purposes of this study was to develop a questionnaire to measure the perceptions of the teacher's feedback in physical education and examine the relationships between perceptions of different types of teacher feedback and students' intrinsic motivation in physical education.

The validation process of the developed questionnaire, the Perceptions of the Teacher's feedback (PTF), was conducted with Estonian middle and high school students. Both exploratory and confirmatory factor analyses provided support for the reliability and validity of the PTF for measuring both verbal and nonverbal perceived teacher feedback in a population of middle and high school students in physical education. The influence of different types of perceived learning environment on intrinsic motivation in physical education was also investigated. The effect of leisure-time sport participation on different types of

perceived teacher feedback and dimensions of perceived learning environment and intrinsic motivation was established. In addition, the stability of the most effective type of perceived teacher feedback (i.e., perceived positive general feedback) and a dimension of perceived learning environment (i.e., perceived threat to sense of self) on intrinsic motivation in physical education over a two-year period was examined. Finally, the causal relationship between perceived positive general feedback and perceived threat to sense of self was determined.

2. REVIEW OF LITERATURE

2.1. Theoretical framework

Deci and Ryan's (1985) cognitive evaluation theory serves as the theoretical framework for the current work. Cognitive evaluation theory was presented by Deci and Ryan as one of the four subtheories within the more general self-determination theory (Deci & Ryan, 1985, 1991; Ryan, 1995) that had the aim of specifying different factors that explain variability in intrinsic motivation. More specifically, cognitive evaluation theory focuses on the impact of social and environmental factors that could facilitate versus undermine intrinsic motivation. It is assumed that intrinsic motivation, being inherent to all people, will be enhanced when people are conditions conducive to enhancing intrinsic motivation.

According to Ryan and Deci (2000), cognitive evaluation theory was formulated to explain the effect of external events such as rewards, feedback from significant other, or other external events on intrinsic motivation. Cognitive evaluation theory posits that the critical factor in motivation is not the reward or feedback statement itself, but the person's interpretation of the reward or feedback. Cognitive evaluation theory focuses primarily on the basic fundamental needs for competence and autonomy or self-determination, and implies that individuals are intrinsically motivated towards an activity when they feel competent and self-determined toward that activity. The theory suggests that social-contextual factors such as feedback, communication, or rewards that engender or lead to feelings of competence and self-determination during activity can enhance intrinsic motivation for that activity. Conversely, situations that provide failure feedback undermine one's feelings of competence and self-determination should lead to a loss of intrinsic motivation for the activity.

2.2. Motivation in sport and exercise

Motivation has been defined as the direction and intensity of effort (Sage, 1977), and it is viewed as a key factor influencing learning or achievement outcomes (Chen, 2001). Several conceptual perspectives have been proposed to better understand individuals' motivation in sport and exercise domain (Roberts, 1992). However, one perspective that has been found to be most applicable in the area of sport and exercise posits that behaviour can be intrinsically motivated, extrinsically motivated, or amotivated (Deci, 1975; Deci & Ryan, 1985; 1991).

According to Deci and Ryan's (1985; Ryan & Deci, 2000, 2002) basic psychological needs theory in the global self-determination theory framework, people are motivated to satisfy basic and universal needs for competence,

autonomy, and relatedness. The need for competence is the need to achieve desired outcomes and experience mastery and effectiveness in giving activity. The need for autonomy refers to individuals' effort to have a say over their behaviour, while the need for relatedness is the need to be accepted by others and interact effectively with them within a social context (Deci et al., 1994). The extent to which behaviours and activities fulfil or satisfy these psychological needs will determine the type of motivation experienced by the individual (Deci & Ryan, 2000). For example, high levels of need satisfaction in an activity will likely to result in high level of intrinsic motivation. On the contrary, lack of need satisfaction should result in extrinsic motivation or even amotivation.

2.2.1. Different motivational orientations in sport and exercise

Since social conditions vary greatly and individuals perceive them differently, people's reasons or motives for participating in an activity will also vary accordingly. There are different types of motivation central to the self-determination theory (Deci & Ryan, 1985, 2000). Each type of motivation reflects a qualitatively different reason for the behaviour in a giving context and these can be classified along a continuum of self-determined behaviour. In general, the theory distinguishes between autonomous and controlling forms of motivation. The most autonomous form of motivation is intrinsic motivation, which lies at one extreme pole of this continuum. Extrinsic motivation, on the other hand, is the most controlling form of motivation and lies on the opposite pole to intrinsic motivation on the continuum of self-determination.

An individual who is intrinsically motivated towards particular activity will participate in the activity purely for the pleasure and satisfaction derived from doing the activity and without any external reinforcement (Deci, 1975). Vallerand et al. (1992) identified three types of intrinsic motivation: intrinsic motivation to know, intrinsic motivation to accomplish, and intrinsic motivation to experience stimulation. Intrinsic motivation to know can be defined as performing an activity for the pleasure that one experiences while learning, exploring, or trying something new. Intrinsic motivation to accomplish is defined as practicing an activity for the pleasure of outdoing oneself and the process of trying to reach new personal objectives. Finally, intrinsic motivation to experience stimulation occurs when someone engages in an activity in order to experience the pleasant sensations derived from the activity itself. These kinds of behavioural participation are likely to satisfy the basic and universal needs for competence, autonomy, and relatedness.

However, people are not always intrinsically motivated, but may still have a relatively high degree of autonomous motivation toward a particular activity. Therefore, the next major classification involves extrinsic motivation. In general, extrinsic motivation pertains to a wide variety of behaviours that are

engaged in as a means to an end (Deci, 1975). Researchers have proposed that there are different types of extrinsic motivation that can be ordered along a self-determination continuum (Ryan et al., 1990). The three main types of extrinsic motivation are identified, introjected, and external regulation in order from higher to lower levels of self-determination.

Adjacent to intrinsic motivation on the self-determined continuum is identified regulation, a construct that reflects peoples' motives to participate in an activity for the attainment of a personally-relevant goal. Although the participation in an activity is internally regulated and self-determined, it is still performed for extrinsic reasons, which means that reasons are contingent on factors other than engaging in the activity itself. Introjected regulation reflects behaviours that are performed to avoid negative feelings of guilt and shame or to gain positive psychological outcomes such as contingent self-worth or pride (Pelletier et al., 1995). External regulation is the most extreme that lies on the opposite pole to intrinsic motivation on the continuum of self-determination. External regulation refers to behaviour that is controlled by external sources, such as material rewards or constraints imposed by others (Deci & Ryan, 1985). Externally-regulated behaviours are perceived by people as originating from outside both the person and the self (Deci et al., 1994).

In addition, it has been suggested that a motivational state known as amotivation exists which refers to the state of lacking the intention to act and is considered the lowest level along a self-determination continuum. Amotivated people either do not act at all or act without intent (Ryan & Deci, 2000). An individual that is amotivated do not see the value of activity (Ryan, 1995), do not feel competent to do it (Bandura, 1986), or not expect it to yield a desired outcome (Seligman, 1975).

According to Weiss and Ferrer-Caja (2002), people may participate in an activity for multiple reasons, which may include also a combination of intrinsic and extrinsic motives. However, there are number of advantages accrued by persons who engage in an activity for more intrinsic reasons. For instance, intrinsically motivated people are more likely to exert more effort and exhibit greater levels of skill learning relative to those who are more extrinsically motivated (Vallerand & Losier, 1999; Weiss & Ferrer-Caja, 2002). In contrast, high extrinsic motivation has been associated with increased state anxiety (Scanlan & Lewthwaite, 1984), increased dropout from sport (Lindner et al., 1991), and a tendency to participate in sport to gain some reward and not for sport itself (Watson, 1984). Therefore, giving the benefits of participating in activities for more intrinsic motives, determining factors that are related to the development of intrinsically motivated behaviour is a crucial research goal.

2.3. Measuring motivation in sport and exercise

In sport and exercise psychology the topic of motivation has been well-studied, with at least 37 published scales devoted to exercise motivation and at least 20 devoted to sport motivation (Ostrow, 1996). Several questionnaires focus on intrinsic or intrinsic and extrinsic motivation in sport and exercise setting, including the Motivation for Physical Activity Measure (Frederick & Ryan, 1993; Ryan et al., 1997), the Exercise Motivation Scale (Li, 1999), the Intrinsic Motivation Inventory (McAuley et al., 1989), the Motivational Orientation in Sport Scale (Weiss et al., 1985), and the Sport Motivation Scale (Pelletier et al., 1995). The following two sections will focus on the Intrinsic Motivation Inventory (McAuley et al., 1989) and the Sport Motivation Scale (Pelletier et al., 1995) due to the relevance of these two questionnaires to this dissertation.

2.3.1. Intrinsic Motivation Inventory

The Intrinsic Motivation Inventory (IMI) has gained widespread use and acceptance as a measure of intrinsic motivation in the context of sport and exercise. The development of IMI in a sport setting has been largely the result of McAuley et al.'s (1989; 1991) research. The IMI is a multidimensional measurement device intended to assess participants' subjective experience related to a target activity. According to McAuley et al. (1989) and McAuley et al. (1991), the IMI assesses participants' level of intrinsic motivation as an additive function of four underlying dimensions of interest-enjoyment, perceived competence, effort-importance, and tension-pressure. The underlying rationale of the IMI is that when individuals are intrinsically motivated, they should be experiencing mentioned affective/cognitive states (e.g., interest-enjoyment) and exhibiting such types of behaviour (e.g., effort).

Overall, results on the reliability of the IMI have revealed that most of its constituent subscales are reliable. More specifically, internal consistency of the four subscales as assessed by Cronbach alphas has ranged from .63 for tension-pressure to .91 for interest-enjoyment (Duda et al., 1995; McAuley et al., 1989; Seifriz et al., 1992). Although, a Cronbach alpha of .63 is considered somewhat low, it should be noted that alpha coefficient is biased against scales comprising a low number of items (Smith et al., 1995).

However, data on the factorial validity of the IMI is questionable (Markland & Hardy, 1997; Vallerand & Fortier, 1998). Using confirmatory factor analysis, McAuley et al. (1989) tested several models and found that a hypothesised five-factor hierarchical model with four first-order factors (interest-enjoyment, perceived competence, effort-importance, and tension-pressure) and a second-order factor representing intrinsic motivation was the best model. Fit indices for this proposed model were as following: $\chi^2(101) = 252.36$, $\chi^2/df = 2.499$, Goodness

of fit index (GFI) = .788, Normed Fit Index (NFI) = .76, Root Mean Square Residual (RMSR) = .136. According to Bentler (1990), however, values greater than .90 for GFI and NFI have been considered to reflect an acceptable fit of the model to the data, and typically values below .10 for RMSR has seen as acceptable. Thus, fit indices for the IMI are somewhat low and cast doubt to the factorial validity of the scale.

In addition to the factorial validity problem, there is also a theoretical issue with respect to the hierarchical model of the IMI proposed by McAuley et al. (1989). Specifically, in addition to assessing elements closely related to intrinsic motivation (i.e., interest-enjoyment), the IMI also assess antecedents (e.g., perceived competence) and consequences (e.g., effort-importance) of intrinsic motivation and these could not be placed at the same conceptual level (Markland & Hardy, 1997; Vallerand & Fortier, 1998). A study of William and Gill (1995) also demonstrated that some elements of the IMI influence each other. In particular, perceived competence positively influenced interest-enjoyment, which in turn, determined effort-importance. Although the IMI has been widely used to measure intrinsic motivation in a sport and exercise context, one should acknowledge the issues mentioned above when using the IMI as a measure of intrinsic motivation.

2.3.2. Sport Motivation Scale

Another measure of motivation within the sporting domain is the Sport Motivation Scale (SMS) which is probably most widely used and accepted. Originally developed in French (the Echelle de Motivation dans le Sport, EMS; Brière et al., 1995), the EMS was translated into English and validated by Pelletier et al. (1995). The EMS/SMS is designed according to the tenets of self-determination theory and represent the self-determination continuum (Deci & Ryan, 1985; Ryan & Deci, 2000). It consists of seven subscales: amotivation, external regulation, introjected regulation, identified regulation, intrinsic motivation to know, intrinsic motivation to accomplish, and intrinsic motivation to experience stimulation.

Preliminary validation studies of the EMS with approximately 500 athletes (approximately 19 years of age) revealed that it had satisfactory internal consistency levels (Cronbach alphas ranging from .71 to .92), as well as moderate-to-high indices of temporal stability over a one-month period (test-retest correlation ranging from .54 to .82). Results of a confirmatory factor analysis confirmed the seven-factor structure of the EMS (GFI = .90 and a RMSR < .10, Brière et al., 1995).

Pelletier et al. (1995) conducted series of two studies with 593 athletes with a mean age of 19.2 years in order to assess psychometric properties of the English-language version of the EMS, the SMS. Results indicated satisfactory internal consistency (Cronbach alphas ranging from .63 to .80) and temporal stability over a 5-week period (test-retest correlations ranging from .58 to .84).

Also, a seven-factor structure was confirmed through a confirmatory factor analysis that revealed acceptable fit indices ($\chi^2(329) = 637.49$, χ^2/df ratio = 1.94, GFI = .94, AGFI = .92, NFI = .92, RMSR = .048). In addition, Pelletier et al. (1995) also provided support for the simplex pattern that was obtained earlier with the EMS. In other words, they supported the existence of the self-determination continuum by showing that subscales closer to each other on the continuum (e.g., amotivation and external regulation) were correlated more highly in a positive direction than those apart on the continuum (e.g., intrinsic motivation to know and external regulation).

Li and Harmer (1996), using a sample of 857 college students, also confirmed the seven-factor model of SMS. Additionally, the authors performed a second-order confirmatory factor analysis to test the appropriateness of combining the three types of intrinsic motivation into a single-scale score. The results indicated that the high-order factor (intrinsic motivation) adequately accounted for the covariations among the three first-order factors (i.e., three intrinsic motivation subscales of the SMS).

Recently, Martens and Webber (2002) tested the factor structure of the SMS with the population of college student athletes from United States. They found some evidence for the reliability and validity of the SMS in a college-aged population, but also uncovered some problems with the hypothesized SMS model, including a lack of fit for the model. In order to elucidate the misspecification of the SMS model with their population, they assessed intrinsic components, extrinsic components, and amotivation component of the model separately. The results revealed that the intrinsic motivation component of the SMS model yielded strongest fit indices compared with extrinsic motivation component and amotivation component, suggesting that problems with the SMS model misspecification may be mostly in the extrinsic motivation subscales.

More recently, Standage et al. (2003) confirmed the application of the SMS to the physical education context with the population of secondary school students from the United Kingdom on the basis of the results of a confirmatory factor analysis, $\chi^2(329) = 738.53$, χ^2/df ratio = 2.24, CFI = .92, SRMR = .07, RMSEA = .06. However, the results suggested combining the three intrinsic motivation subscales with the identified regulation subscale due to very high correlations between these subscales (correlations ranging from .86 to .99). These findings suggest a lack of discriminant validity of these four dimensions (Standage et al., 2003).

Despite the mixed support for the validity of the SMS, it is widely used by several researchers (e.g., Doganis, 2000; Petherick & Weigand, 2002; Vlachopoulos et al., 2000; Yves & Vallerand, 1995) who have investigated the different types of motivation among athletes or adults participating in sport clubs. Further advantages of the SMS are that it enables to assess intrinsic and extrinsic motivation independently from each other and the assessment of intrinsic motivation, for example, is not confounded with motivational determinants and consequences as it was evident in the IMI (Vallerand & Fortier, 1998).

2.4. Feedback in the teaching-learning process

One of the most important roles of the teacher in teaching motor skills involves reacting appropriately to their students' performances. The ability of teacher to provide information to learners about the mistakes and achievements made in a performance is considered an important competency for the professional teacher (Hellison & Templin, 1991; Magill, 1993). This extrinsic information provided by the teacher to the learner about his or her performance is called feedback. Contingent upon students' behaviour, its purpose is to reinforce students' correct motor response, eliminate performance errors, or both (Fishman & Tobey, 1978).

By nature, the feedback may be either general or specific/informational and may be delivered in a positive or negative manner. Feedback is general when it could refer to either learner's movement or behaviour and does not tell the learner exactly what was performed well or poorly. Feedback is specific when it contains information that allows the children to know specifically what they need to practice or how exactly they are moving (Claxton & Fredenburg, 1989; Mustain, 1990; Rink & Werner, 1987). Throughout the motor learning and pedagogy literature there seems to be an agreement that feedback, which contains positively-stated information about performance and how to improve it, is associated with better motor skill acquisition (e.g., Fairweather & Sidaway, 1994; Landin, 1994; Zubiaur, Ona, & Delgado, 1999; Fredenburg, Lee, & Solmon, 2001).

Besides verbal forms of feedback there are also nonverbal forms of feedback such as positive or negative facial expression (e.g., smiling, eye contact or anger, disgust), physical contact (e.g., touching or patting on a shoulder), or other gestures (e.g., clapping the hands, the 'thumbs-up' gesture). The theorists and researchers have indicated that in order to convey a clear and consistent message to students, it is important for teachers to use both verbal and non-verbal communication (Martens, 1987; Yukelson, 1998). Moreover, according to Martens (1997), over 70% communication is nonverbal.

2.4.1. The feedback as a source of perceived competence and intrinsic motivation in sport and exercise

A number of motivational theories highlight the importance of perceptions of competence in achievement settings (Deci & Ryan, 1985, 2000; Harter, 1978, 1981, 1998; Nicholls, 1989). It is crucial, therefore, to discover the antecedents of perceived competence and understand how one comes to judge his/her competence.

Several theoretical models, developed by Ames (1984), Dweck and Leggett (1988), Harter (1990), and Nicholls (1984, 1989) have indicated that perceived

competence is a function of the type of information that individuals use to judge their performance ability. In these models several different sources of competence information are identified. Horn et al. (1993), however, have identified a total of 10 possible sources of competence information. According to these authors the sources of competence are: teacher, coach, peer and parental feedback, self comparison, degree of skill improvement over time, speed of learning new skills, amount of effort exerted, enjoyment of the sport, performance statistics, game outcome (win, lose), achieving self-set goals, and game related feelings. One factor, however, that is particularly important in achievement settings is feedback from parents, teachers, and coaches (Ames, 1992; Deci & Ryan, 1985, 2000; Harter, 1978, 1981, 1998).

According to Harter's (1978, 1981, 1998) competence motivation theory, praise and encouragement from supervisors as the result of successful independent mastery attempts would result in enhanced perceptions of competence, positive affect, and motivated behaviour in learners and engender their desire to continue to participate. On the other hand, negative responses from significant others and perception of failure is expected to decrease perceived competence, perceptions of control, and result in the learner avoiding further attempts to master the task.

Deci and Ryan's (1985, 2000) cognitive evaluation theory and more general self-determination theory also contains explicit hypotheses regarding the relationship between feedback and perceived competence and motivation. Situations that provide feedback related to failure are more likely to generate feelings of incompetence and undermine one's intrinsic motivation for the given activity. Vallerand (1997) incorporated the fundamental needs for competence, autonomy and relatedness from the self-determination perspective in the hierarchical model of intrinsic and extrinsic motivation and proposed the following motivational sequence model: social factors → psychological mediators → types of motivation → consequences. According to Vallerand (1997), such a motivational sequence operates at three levels of generality, namely the global (or personality), contextual (or life domain such as physical education context), and situational (or state) levels. Basically, this proposed model means that social factors (e.g., coaches/teachers' feedback, success/failure, competition/cooperation) influence individuals' needs for competence, autonomy, and relatedness (i.e., the psychological mediators), which in turn determine their motivation in a given situation. Different types of motivation then lead to the host of consequences (e.g., effort, persistence, future activity intentions, boredom, etc.). It should be noted that Deci and Ryan (1985, 1991; Ryan & Deci, 2000) have posited the same logical pattern of associations between social factors, psychological mediators and motivation. Support for the link between feedback and children's and adolescents' perceived competence in the physical domain has been provided by several authors and researchers (Amorose &

Smith, 2003; Amorose & Weiss, 1998; Goudas et al., 2000; Horn, 2004; Horn & Amorose, 1998; Weiss & Amorose, 2005).

One of the first experimental studies in the physical domain that demonstrated the effect of feedback on perceptions of competence and intrinsic motivation was that of Vallerand and Reid (1984). They manipulated feedback by making verbal comments to subjects about their performance on a stabilometer task, suggesting that they were doing either well or poorly. Perceived competence and intrinsic motivation was assessed using self-report scales. The results indicated that positive feedback led to enhanced intrinsic motivation while negative feedback reduced it. A path analysis, however, showed that the effect of verbal feedback on intrinsic motivation was mediated by perceptions of competence. Vallerand and Reid's (1984) findings have been replicated in the physical activity (Whitehead & Corbin, 1991) and sport settings (Losier & Vallerand, 1994). For example, Losier and Vallerand (1994) showed that perceived competence revealed to be the determinant of motivation over a 5-month period and not vice versa. However, the authors did not exclude the possibility that within-time motivation may also influence perceptions of competence. This finding provides additional evidence on the causal link between perceived competence and intrinsic motivation.

In conclusion, according to the literature, positive feedback from parents, teachers, and coaches enhances the learner's perceptions of competence and intrinsic motivation, whereas negative feedback lowers these perceptions. However, the learner might interpret the feedback obtained from their teacher, coach or supervisor differently. Therefore, it is insufficient to merely provide feedback for the learner alone but it is also essential to understand how the learner perceives the feedback provided by their teachers, coaches, and supervisors.

2.5. The importance of learners' perceptions in the teaching-learning process

A large number of studies have used the performance-based model or process-product paradigm to understand the effective learning environment (Solmon & Lee, 1997). In general, these studies have examined the direct relationships between teacher behaviour and student achievement. For a better understanding of the multifaceted process of teaching and learning, however, it is crucial to examine how learners think about this process. According to Wittrock (1986), these cognitive processes are defined as students' thoughts or cognitions that influence their perceptions.

In a general sense, Eccles and Harold (1991) have stated that an individual's interpretation of reality or a certain activity, rather than reality or activity itself, directly influences his or her choice to engage in that activity. In other words, if an individual has a positive disposition towards particular activity or perceives

positive experiences, he or she will more likely choose to participate in that activity. Social-cognitive research in educational settings has also clearly shown that learners' experiences, thoughts, and perceptions influence their affect, motivational behaviour, and skill acquisition (Bakker, 1999).

Lee et al. (1999) have suggested that while many teacher practices increase students' motivation to learn, it should be noted that the effectiveness of each practice will depend in part, on how it is perceived and interpreted by the learner. In the sport domain, Smoll and Smith (1989) have proposed the cognitive-mediational model in which "the ultimate effects of coaching behaviours are mediated by the meaning that players attribute them" (p. 1527). Lately, Horn (2002) and Mageau and Vallerand (2003) have embedded this notion by claiming that the effect of coaches' behaviour on athletes' self-perceptions such as perceived competence and level of motivation are mediated by athletes' perceptions of coaches' actual behaviours. Using questionnaires as indicants of students' thoughts and perceptions, several researches have noted that self-reported thoughts are more accurate predictors of students' achievement than the observers' estimations (Peterson & Swing, 1982; Peterson et al., 1984). Given the crucial role of learners' perceptions, examining different aspects of students' perceptions in the teaching-learning process, like perceptions of feedback, provided by the teacher in physical education is an important research goal.

2.6. Measuring the perceived feedback types in sport

The most commonly used instrument for assessment of the type, frequency, and quality of the feedback coaches give to their athletes in practice has been the Coaching Behavior Assessment System (CBAS) that was developed and validated by Smith et al. (1977). The CBAS is an observation-based instrument, which enables the assessment of 12 categories of coaching behaviours. Although the CBAS was originally developed as an observation-based instrument, it has also been adapted into questionnaire form. Specifically, Smith et al. (1978) and Smoll et al. (1978) developed a corresponding questionnaire to assess athletes' perceptions of coaches' behaviour. In this questionnaire, athletes are provided with a description and example of each of the 12 behaviours from the CBAS. The athletes are then asked to indicate the extent to which their coach exhibits each type of behaviour.

Other researchers (Allen & Howe, 1998; Amorose & Horn, 2000; Black & Weiss, 1992) have also developed and used questionnaire version of the CBAS. These authors have shortened and modified the questionnaire version of the CBAS to specifically measure athletes' perceptions of the type of feedback coaches give their athletes in response to athletes' performance successes and failures.

Black & Weiss (1992) assessed adolescent swimmers' perceived coach's feedback using 10 categories from CBAS; four categories that represented behavioural responses to athletes' successful performances or efforts (i.e., praise only, no response, information only, and praise combined with information) and six categories that represented behavioural responses to unsuccessful performances or errors (i.e., encouragement only, no response, criticism, corrective information, encouragement combined with corrective information, and criticism combined with corrective information).

Allen and Howe (1998) used a questionnaire version of the CBAS that was very similar to that used by Black and Weiss (1992) modified to be specific to field hockey. Allen and Howe's (1998) study used the augmented questionnaire, which included a further six items to measure two additional types of perceived nonverbal feedback, and administered it to adolescent female field hockey players. A factor analysis of scores from this inventory revealed seven interpretable factors accounted for 50.6 % of the common variance in the original data. The seven factors were encouragement/information, praise/information, nonverbal criticism, critical information, information only, no response, and mistake-contingent non-response. Only four factors, however, attained acceptable internal consistency assessed by Cronbach alphas: encouragement/information (.85), praise/information (.86), nonverbal criticism (.80), and information only (.78). The critical information (.67), no response (.63), and mistake-contingent non-response (.59) factors were deemed to be unreliable and were excluded.

Amorose and Horn (2000) investigated the relationship between intrinsic motivation and the perceived feedback among athletes from different sports. The Coaching Feedback Questionnaire (CFQ) was developed as a questionnaire version of the CBAS. Amorose and Horn's (2000) questionnaire comprised 16 items representing eight different types of feedback. Three categories characterized the coach's responses to successful performances (i.e., praise/reinforcement, no reinforcement, reinforcement combined with technical instruction) and five characterized responses related to performance errors (i.e., mistake-contingent encouragement, ignoring mistakes, corrective instruction, punishment, and corrective instruction combined with punishment). An exploratory factor analysis revealed three perceived feedback dimensions which accounted for 49.8% of variance in the data. The three factors were positive and informational feedback, punishment oriented feedback, and nonreinforcement/ignoring mistakes and they had satisfactory internal consistency. Although, the coefficients of internal consistency for all these subscales were acceptable, ranging from .72 – .83, the factor structure of the CFQ was not subjected to confirmatory factor analysis.

The review of studies concerning the perceived feedback by subordinates in sport show a variety of factors characterising the types of feedback, depending on the specific area. However, to our knowledge no study has attempted to develop a valid and reliable measure to examine students' perceptions of teacher feedback in physical education.

2.6.1. The relationship between perceived feedback and intrinsic motivation in sport

Following the evidence from experimentally-based studies that have shown the link between actual feedback from supervisors and their subordinates' psychological outcomes, the relationships between players' perceptions of their coaches' feedback and psychological outcomes such as perceived competence and intrinsic motivation have recently received attention (Allen & Howe, 1998; Amorose & Horn, 2000, 2001; Black & Weiss, 1992; Hollebeak & Amorose, 2005).

Black and Weiss (1992) examined the relationships between athletes' perceptions of their coaches' feedback and the athletes' perceptions of ability or competence and intrinsic motivation. The sample consisted of 312 male and female competitive swimmers ranging in age from 10 to 18 years. Their results, in general, indicated that swimmers who perceived their coaches to provide them high frequencies of praise and information following desirable performances and high frequencies of encouragement and information following undesirable performances exhibited higher scores on measures of perceived competence, and intrinsic motivation than swimmers whose coaches were perceived to give lower frequencies of such kind of positive and informationally-based feedback.

Besides the perceptions of coaches' verbal feedback, Allen and Howe's (1998) study was one of the first attempts to examine relationships between perceptions of coaches' nonverbal feedback and athletes' psychological outcomes. Specifically, they investigated the relationship between perceived coaching behaviour, including perceptions of both verbal and nonverbal feedback and athletes' perceptions of competence and satisfaction with their coach. The sample consisted of 143 female field hockey players, aged 14 to 18 years. First, based on the results of exploratory factor analysis, Allen and Howe (1998) found that nonverbal praise items loaded on the verbal praise/information factor that contributed significantly to the relationships with athletes' perceived competence and satisfaction with the coach. Also, the factor analysis revealed one factor that was composed of two nonverbal and one verbal criticism items. This factor did not contribute significantly to perceived competence and satisfaction. In sum, female field hockey players who perceived their coaches to give high frequencies of verbal and nonverbal praise and informationally-based feedback after successful performances and low frequencies of encouragement and informationally-based corrective feedback after skill-related errors scored higher on the perceptions of competence than players who perceived their coaches to exhibit the opposite feedback patterns. Specifically, high frequencies of encouragement and corrective information for performance errors were associated with lower levels of perceived competence. This result was opposite to the relationships found by Black and Weiss (1992). Allen and Howe (1998) suggested several explanations for this contradiction, which included the possibility that adolescent females may be more sensitive to corrective information

from coaches than previously thought. Also, for adolescent females the corrective information in response to performance errors, although included encouragement, may be seen as a form of helping behaviour and thus the indication of low level of perceived competence.

Amorose and Horn (2000, 2001) examined the influence of perceived coaching feedback patterns on college athletes' (age ranged from 17 to 23 years) intrinsic motivation. Although some slight gender differences emerged, the results indicated that coaches who were perceived to exhibit high frequencies of positive, encouraging, and informational feedback and low frequencies of ignoring players performance attempts, had athletes who reported higher levels of intrinsic motivation (i.e., higher levels of perceived interest-enjoyment, competence, effort-importance, choice, and lower levels of tension-pressure). The results of these studies are consistent with cognitive evaluation theory (Deci & Ryan, 1985), which suggests that the provision of positive (e.g., praise, encouragement) and informational feedback (e.g., technical instruction) should lead to increases in perceptions of competence, which in turn increases individuals' levels of intrinsic motivation. Negative feedback, on the other hand, provides negative competence information and therefore decreases intrinsic motivation.

The research described above has taken place under the umbrella of cognitive evaluation theory. Hollebeak and Amorose (2005) recently, however, used more general version of self-determination theory (Ryan & Deci, 2000, 2002) as a framework to test whether perceived competence, autonomy, and relatedness mediated the relationships between perceived coaching behaviours, including perceptions of the positive feedback, and college athletes' intrinsic motivation. Results using path analysis revealed support for a mediation effect. Specifically, perceived competence, autonomy, and relatedness had positive and significant effects on athletes' intrinsic motivation. In terms of the effect of perceived positive feedback, athletes' feelings of relatedness were positively predicted by perceived positive feedback. However, a negative and significant effect of perceived positive feedback on perceived competence emerged, a finding that is dissimilar to those from previous studies (e.g., Amorose & Horn, 2001; Whitehead & Corbin, 1991) and inconsistent with the tenets of both cognitive evaluation theory and self-determination theory in general (Deci & Ryan, 1985; Ryan & Deci, 2000, 2002). The authors explained that the negative effect of perceived positive feedback on perceived competence was probably caused by athletes in their sample perceiving the high frequency of positive feedback or praise as non-contingent and inappropriate, which can result in low levels of perceived competence (Horn, 2002).

In conclusion, research over the last decade on the relationships between perceptions of feedback, perceived competence, and intrinsic motivation have received substantial attention in the sport domain. Despite some slight discrepancies, the research suggests that athletes' perceptions of coaches' positive and informational feedback should lead to increases in perceived competence, which

in turn increases intrinsic motivation. Perceptions of the negative feedback, on the other hand, provide negative competence information, which should lead to a decrease in intrinsic motivation. Based on a review of the literature, however, no study has examined the relationships between perceptions of the teacher feedback and students' perceived competence and intrinsic motivation in physical education settings.

2.7. Perceived learning environment and intrinsic motivation in school physical education

It is widely acknowledged that in sport, exercise, and physical education settings one or two key individuals (i.e., the coach, manager, and teacher) can create an environment or climate that is associated with success. In physical education settings, teachers are often credited with creating a positive, motivating, and productive environment in their classes. Therefore, the perceptions learners might have of the environment created by their teacher needs special attention.

The construct of students' perceptions and the relationship of these to motivation in physical education has been conceptualised and investigated in a different ways. The dominant line of research has pursued the investigation of goal orientation and related constructs like perceived motivational climates (e.g., Ames, 1984; Dweck & Leggett, 1988; Nicholls, 1989). Drawing on the work of Ames and Archer (1988) on classroom motivational climate that distinguishes between perceptions of mastery and performance motivational climates, several questionnaires have been developed to assess how the learning environment is perceived by students in school physical education.

According to Ntoumanis and Biddle's (1999) comprehensive review of motivational climate in physical activity the most promising tools for measuring perceptions of motivational climates in physical education setting are the Learning and Performance Orientations in Physical Education Classes Questionnaire (LAPOPECQ, Papaioannou, 1994) and the Physical Education Class Climate Scale (PECCS, Goudas & Biddle, 1994) a modification of the LAPOPECQ.

Papaioannou (1994) was one of the first researchers to examine perceived motivational climate in physical education. As a result, Papaioannou (1994) developed the LAPOPECQ to assess students' perceptions of learning orientation and performance orientations in physical education classes. The LAPOPECQ comprises five subscales: class learning environment, teacher's promotion of learning environment, class competitive orientation, students' worries about mistakes, and winning without effort. Results of the confirmatory factor analysis confirmed the hierarchical structure of the LAPOPECQ. Specifically, two factors were explained by a global, second-order learning orientation factor

and the other three factors constituted a general, second-order performance orientation factor.

In sum, research findings suggest that the perception of mastery or learning oriented environment, focused more on personal improvement than on outperforming others, is positively related to adaptive motivational patterns in physical education (Ferrer-Caja & Weiss, 2000, 2002; Papaioannou, 1994, 1995). Ferrer-Caja & Weiss (2000), for example, used the LAPOPECQ to examine the relationship between perceived learning environment and intrinsic motivation in a sample of high school students taking the physical education as a required course. Using structural equation modelling results revealed that the positive effect of perceived mastery or learning climate on intrinsic motivation was mediated by perceived competence and task goal orientation.

Drawing on the work of Ames (1992), Goudas and Biddle (1994) suggested that other classroom features might promote a mastery or learning and ego or performance climate in physical education. Goudas and Biddle (1994) argued that distribution of authority (i.e., involving students into decision-making, and providing choices to students), was one of the factors that may influence the salience of one goal or another (Ames, 1992), has not been examined in physical education context. Therefore, Goudas and Biddle (1994) added two factors to the LAPOPECQ to form the PECCS. These were students' perceptions of choice and students' perceptions of teacher support. Exploratory factor analysis yielded a six-factor structure for the PECCS. Further, Goudas and Biddle (1994) showed that the six first-order factors loaded on two second-order factors. The first higher-order factor was called mastery climate and consisted of the students' perceptions of choice, students' perceptions of teacher support, teacher-initiated learning, and student learning subscales. The second higher-order factor was called performance climate and consisted of the class competitive orientation, and students' worries about mistakes subscales. To provide support for the predictive validity of PECCS, Goudas and Biddle (1994) examined the multivariate relationships between the mastery and performance factors and intrinsic motivation in physical education. They found that students perceiving physical education classes to be high in both mastery and performance climates reported more enjoyment and perceived competence than students in classes with different combinations of climate. It is essential to note that the construct validity of PECCS was also tested in a cross-national study using a French version (L'Echelle de Perception du Climat Motivational, EPCM, Biddle et al., 1995).

Recently, Standage et al. (2003) using the English version of EPCM demonstrated that basic and universal psychological needs of competence, autonomy, and relatedness from the self-determination theory (Deci & Ryan, 1985, 1991) mediated the effect of perceived motivational climate on self-determined motivation among secondary school students in physical education. Specifically, students' perceptions of autonomy-supportive climate and perceptions

of mastery climate positively influenced students' basic needs to foster self-determined motivation.

An another approach to study the perception of class climate in physical education setting without emphasising on children's perception of different goal orientation was adopted by Mitchell (1996). Based on the research of Deci et al. (1981) and Deci and Ryan (1985), Mitchell (1996) developed the Physical Education Learning Environment Scale (PELES) for measuring students' perceptions of the learning environment in physical education on dimensions of perceived challenge, perceived threat to sense of self, perceived competitiveness, and perceived internal control. The initial exploratory factor analysis yielded the four-factor model as hypothesised. However, the items designed to measure perceived internal control loaded significantly across all four factors. In order to clarify the validity of the three first factors, the internal control subscale was eliminated and an exploratory factor analysis was performed again. This yielded a three-factor solution with each factor loading greater than .40 on only one factor. Cronbach alpha coefficients for retained subscales were satisfactory, ranging from .71 to .75. Mitchell (1996) observed 6 to 8 grade students in physical education settings and found that middle school students' intrinsic motivation is likely to be high when they perceive the learning environment to be non-threatening to their self-esteem and physically challenging. These findings were confirmed and replicated by Mitchell and Chandler (1996) with another sample of 8 graders.

However, the three-factor structure of the PELES was not tested with the more powerful confirmatory factor analysis technique. Therefore, as noted by Ntoumanis and Biddle (1999), further psychometric analysis of the PELES is needed, especially to confirm its factor structure before it can be regarded a valid instrument.

2.8. Leisure-time sport participation as a factor influencing students' perceptions and intrinsic motivation in physical education

Frequently, the focus of physical education is on teaching different sports skills. Nowadays children, however, have opportunities to become acquainted with sport activities in settings other than school – like sport clubs in their leisure time, so some are already familiar with the content of physical education lessons. According to Fox (1992), other students, however, who have not played a sport in their leisure time, learning sport skills in physical education may present a challenge of their self-worth. Such differences among children may have an effect on their intrinsic motivation in physical education.

According to Goudas at al. (2001), there is limited evidence regarding the effect of leisure-time sport participation on intrinsic motivation in school

physical education. Nevertheless, Anderssen (1993) reported that students with sports experience hold more favourable attitudes toward physical education than students without any sports experience. Similarly, Goudas et al. (2001) research indicated that Greek secondary school students' intrinsic motivation and perceived competence in physical education differs depending on whether they participate in organised sports after school. They concluded that students with sports experience reported significantly higher ratings on intrinsic motivation than students without sports experience. Also, students with higher perceived competence reported liking physical education more than students with low perceived competence. Furthermore, recent research suggest that school children reporting high levels of autonomous motivation in a physical education also report high levels of autonomous motivation toward physical activity in a leisure-time context (Hagger, et al., 2003; Hagger et al., 2005).

In conclusion, the differences in some psychological constructs such as perceived competence and intrinsic motivation among students with differing levels of sports experience were found. However, there is no evidence regarding the effect of leisure-time sport participation on the different domains of perceived learning environment such as perceptions of challenge, perceptions of threat to sense of self, and perceptions of teachers' feedback in school physical education. Examining the effect of leisure-time sport participation on perceived learning environment and perceived teacher's feedback in physical education provides important implications for practicing teachers to deal with students with different sport experiences appropriately.

2.9. Unresolved issues

Based on the review of literature, the relationships between perceptions of feedback and perceived competence (Allen & Howe, 1998; Black & Weiss, 1992) and intrinsic motivation (Amorose & Horn, 2000, 2001; Hollembeak & Amorose, 2005) has been investigated in the sport domain more extensively when compared with the domain of physical education. Studies in the sport domain has revealed that athletes' perceptions of coaches' positive and informational feedback should lead to increases in perceived competence, which in turn increases intrinsic motivation. Perceptions of the negative feedback, on the other hand, provide negative competence information, which should lead to the decrease in intrinsic motivation.

Although several questionnaires have been developed for studying dimensions of the physical education learning environment, a number of questions remain unanswered. The research conducted in the area of perceptions of learning environment in physical education has not thus far dealt with students' perceptions of feedback provided by the teacher and its impact on intrinsic motivation. The dearth of such research may also be attributed to the absence of

a valid and reliable tool to assess students' perceptions of the teacher's feedback in physical education. Therefore, it is still unclear whether and to what extent the perceptions of different types of teacher feedback are related to students' intrinsic motivation in physical education.

Some of the students' characteristics such as gender and age have shown to have an effect on their perceptions of learning environment and intrinsic motivation in physical education (Biddle & Chatzisaratis, 1999; Mitchell, 1996; Wang & Biddle, 2001). Results of the Mitchell's (1996) study, for example, revealed that middle school male students perceived a higher degree of challenge and competitiveness and less threat to their sense of self in physical education than female students. Males had also higher scores on intrinsic motivation than their female counterparts. Recent longitudinal (Prochaska et al., 2003) and cross-sectional studies (Van Wersch et al., 1992) have shown that interest and enjoyment in physical education tend to decline with age. Although, differences in intrinsic motivation in physical education as a function of leisure-time sport participation has been established (Anderssen, 1993; Goudas et al., 2001), the effect of leisure-time sport participation on different types of perceived teacher's feedback and different dimensions of perceived learning environment is still unclear.

While the relationship between perceptions of positively stated, informational feedback and perceived competence and intrinsic motivation has been recognized in sport domain, researchers have not addressed changes in perceptions of the feedback as athletes grow older. The same is apparent in the physical education domain. Therefore, when the relationship between perceptions of the different types of teacher's feedback and intrinsic motivation is established in physical education, it is also essential to determine how students' perceptions of teacher feedback might change or exhibit stability over time to make such findings more robust. For practicing teachers knowing the relative change or stability of students' perceptions of the teacher feedback over time might be helpful to select more appropriate type of feedback for motivating students to acquire skills in physical education in a long-time basis. Longitudinal studies, therefore, are needed in this area. Change may occur in the distributions of the scores of cognitive variables over time and such changes can be studied by examining the degree to which a particular variable demonstrates a similar longitudinal change pattern within individuals. This can be tested by investigating the regression coefficient of a variable on itself across two time points (Hertzog & Nesselroade, 1987).

Also, the direction of causality between different dimensions of perceived learning environment and perceived teacher feedback in physical education is not clear. For example, does students' perceptions of positive feedback from teachers result in lower perceptions of threat to their sense of self in physical education? According to Mitchell (1996), the perception of threat to sense of self was strongest predictor of middle school students' intrinsic motivation in physical education. Or, on the contrary, do low perceptions of threat to the sense

of self result in high perceptions of teacher positive feedback? Longitudinal, cross-lagged panel designs allow researchers to estimate such relationships. Specifically, such models enable a researcher to tell how one variable like perceived threat to sense of self in physical education at one point in time can account for another variable, like perceived teacher positive feedback, at a second, later point in time. Such time-lagged effects cannot be shown in cross-sectional data (Hertzog & Nesselroade, 1987).

Some issues with regard to questionnaires already developed to examine students' perceptions of the learning environment in physical education still need certain attention. Specifically, further psychometric analysis of the PELES (Mitchell, 1996) is needed, to confirm its factor structure before it can be regarded as a valid instrument, as noted by Ntoumanis and Biddle (1999).

In this study it was hypothesised that students' perceptions of different types of feedback provided by the physical education teacher, may differentially impact on intrinsic motivation. Specifically, it was hypothesised that students' perceptions of both verbal and nonverbal praise and instructional feedback provided by the teacher would have a positive effect on intrinsic motivation, and that students' perceptions of nonverbal criticism would have no effect or a negative effect on intrinsic motivation. It was also expected that perceived positive general feedback and threat to sense of self will exhibit a high degree of stability over a two-year period, and that reciprocal cross-lagged effects would exist between perceived threat to sense of self and perceived positive general feedback.

3. OBJECTIVES OF THE PRESENT STUDY

The general objective of the present study was to investigate relationships between perceived teacher feedback, perceived learning environment, and students' intrinsic motivation in physical education.

The specific aims of the study were to:

1. develop a questionnaire to measure students' perceptions of both verbal and nonverbal teacher feedback in physical education.
2. examine the effect of both perceived verbal and nonverbal teacher feedback and dimensions of perceived learning environment such as perceived challenge, perceived competitiveness, and perceived threat to sense of self on intrinsic motivation in physical education.
3. identify the effect of leisure-time sport participation on students' different types of perceived teacher feedback, perceived challenge, perceived competitiveness, perceived threat to sense of self, and intrinsic motivation in physical education.
4. investigate stability of the perceived positive general feedback and perceived threat to sense of self and the causal relationship between them in physical education over a two-year period.
5. evaluate the construct validity of the Physical Education Learning Environment Scale.

4. METHODS

4.1. Participants

Paper I and Paper II.

The participants were 783 (375 boys and 408 girls) school children aged 12 to 15 years ($M = 12.8$, $SD = 1.3$) in five schools located in the same part of town and were similar to the amount of pupils from the town of Tartu in Estonia. 434 students were studying in Grades 6 and 349 students were studying in Grades 8.

In Paper II students indicated whether they participated in sport outside of school hours in their leisure time, how many times a week, and for how long. The students were divided then into following groups: students who did not participate in a sport after school (boys $n = 169$ and girls $n = 210$); students participating in a sport for up to two years (boys $n = 112$ and girls $n = 116$); and students participating in a sport for more than two years (boys $n = 94$ and girls $n = 82$). Boys and girls were observed separately, so six different groups were formed.

Paper III.

The participants were 638 (268 boys and 370 girls) school children aged 14 to 18 years ($M = 16.1$, $SD = 1.1$) from the same five schools as in Paper I and II. The 339 students were studying in Grades 8 and 299 students were studying in Grades 10. The 13 most extreme cases or, in other words, outliers were excluded from the total of original 638 cases, retaining a final sample size of 625.

Paper IV.

The participants were 302 (169 boys and 133 girls) students from the same five schools as in Paper I, II, and III. Students completed questionnaires on two occasions over a two-year period. The first time the questionnaires were administered, the students were in 6th ($n = 220$) and 8th ($n = 82$) grades aged 12 to 15 years ($M = 12.7$, $SD = .97$, Time 1). The second time, the students were in 8th ($n = 220$) and 10th ($n = 82$) grades aged 14 to 18 years ($M = 14.7$, $SD = .96$, Time 2). Only those students who attended both the Time 1 and Time 2 data collection sessions were included in the analyses ($N = 302$). Students were identified by the date of birth. The outliers were determined and 8 cases that had scores that were 3 or more standard deviations away from the means were identified. These cases were excluded from the original 302 cases, retaining a final sample size of 294. The data collection procedures were identical at both time points. Students were taking physical education as a required course two times a week, 45-min per lesson. The same physical education teacher taught students during the two-year follow up period.

4.2. Measures

Paper I and Paper II.

Perceptions of the Teacher's Feedback (PTF)

A new instrument to measure perceptions of the teacher's feedback in physical education was developed. The items were generated based on previously used feedback categories in the sport domain (Allen & Howe, 1998; Amorose & Horn, 2000; Amorose & Weiss, 1998) and the results of a pilot study. In the pilot study, using the Self-Assessment Feedback Instrument (SAFI, Mancini & Wuest, 1989) the frequency and types of feedback provided by two teachers during 22 physical education lessons were recorded. Analyses of the more frequently used types of feedback resulted in the formation of six feedback categories: praise, instruction, instruction during performance, encouragement, criticism, and confirmation/reinforcement. Based on these initial findings, 12 items were developed to measure the perception of teacher's feedback.

First, to evaluate the content validity of developed items, the judgement of experts was applied. Questionnaire items were delivered to the panel of experts in the field. Experts confirmed suitability of the items to measure students' perceptions of teacher's feedback in physical education. Second, these 12 items were then administered to a small group of students (N = 21). Standardized instructions were given, and students completed the questionnaire. Students were asked to indicate the agreement with items on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). They were then interviewed informally and individually and asked whether or not they understood the items and what they thought the items meant. Based on these interactions, it was clear that students understood the concept of each question and did not report any difficulties completing the questionnaire.

The PTF was then administered to a sample of 783 students aged 12 to 15 years. In order to establish the construct validity of the PTF questionnaire, the total sample of participants were randomly split to produce two subsamples, one for an exploratory factor analysis (n = 391), and the other for a confirmatory factor analysis (n = 392). Three factors emerged in the principal component analysis that accounted for 61.2% of the variance were labelled as perceived positive specific feedback (5 items, e.g., "If the teacher gives me more instruction, I will acquire the exercise faster"), perceived positive general feedback (3 items, e.g., "The teacher often praises me"), and perceived knowledge of performance (2 items, e.g., "The teacher instructs me frequently during the performance") (see Table 2, Paper I). The confirmatory factor analysis with the second subsample supported the three-factor structure. Fit indices were: $\chi^2(24) = 62.16$, χ^2/df ratio = 2.59, GFI = .98, RMSR = .061, RMSEA = .067. The mean scores of the subscales were obtained by dividing the sums of subscales by the number of items. The three subscales exhibited satisfactory internal consistency, Cronbach alpha ranged from .70 to .74. The temporal stability of the scale

revealed acceptable levels (test-retest correlations ranging from .58 to .74) over a one-week period in a small subsample of students (N = 39).

Physical Education Learning Environment Scale (PELES; Mitchell, 1996)

The PELES (Mitchell, 1996) was used to measure the perceived learning environment using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) on dimensions of perceived threat to sense of self (4 items, e.g., “Physical education makes me feel bad about myself”), perceived challenge (6 items, e.g., “Physical education classes challenge my ability”), perceived competitiveness (4 items, e.g., “In physical education we try to do better than others”) and perceived control (10 items, e.g., “When I do well in physical education, it is because of good luck”), with 24 items in total. Referring to the work of Mitchell (1996), the perceived control subscale was removed from the current study because of its lack of construct validity. In order to construct the Estonian version of PELES, the remaining 14 original items were translated into Estonian. Later, all items were back-translated into English by a bilingual expert. The back-translated items were similar in meaning to the original English items.

A principal component analysis with the first subsample resulted in a three-factor solution of the PELES (see Table 1, Paper I). Confirmatory factor analysis indicated that imposing the hypothesised model of the second sample of data produced an acceptable fit, confirming the three-factor structure of the PELES. Fit indices were as follows: $\chi^2(41) = 146.17$, χ^2/df ratio = 3.56, GFI = .95, RMSR = .078, RMSEA = .088. The Cronbach alphas for perceived challenge, perceived threat to sense of self, and perceived competitiveness were .76, .67, and .57, respectively. The perceived competitiveness subscale, with a coefficient of .57, was considered unreliable and was excluded from further analysis. More detailed information concerning the retest of construct validity of the PELES can be found in Paper I.

Negatively stated items were reverse coded. Higher scores represented higher levels on dimensions of perceived learning environment, except the dimension of perceived threat to sense of self, where a higher score represented a lower perception of threat to sense of self.

Intrinsic motivation Inventory (IMI; McAuley et al., 1989)

To measure perceived competence and intrinsic motivation, school children responded to the Estonian version of the IMI. McAuley et al.’s (1989) sport oriented version of the IMI contains 16 items assessing four components of intrinsic motivation: interest-enjoyment (4 items, e.g., “I enjoy physical education classes very much”), perceived competence (4 items, e.g., “I think I am pretty good at physical education”), effort-importance (4 items, e.g., “I put a lot of effort into the physical education classes”), and tension-pressure (4 items, e.g., “I feel tense when I am in physical education classes”). The items of the IMI were adapted to measure the perceived competence and intrinsic motivation

of school children in physical education at school. Items were reworded to reflect students' general level of intrinsic motivation without reference to any particular class activity and then translated into Estonian. Response choices ranged from 1 (strongly disagree) to 7 (strongly agree). The internal reliability of the subscales ranged from .51 for tension-pressure to .88 for interest-enjoyment. The tension-pressure subscale was considered unreliable and was excluded from further analyses. The three subscales were summed to yield a composite measure of intrinsic motivation with a Cronbach alpha of .85.

Paper III.

Modified and revised version of the Perceptions of the Teacher's Feedback scale (PTF)

The original version of the PTF contained three subscales: perceived positive specific feedback, perceived positive general feedback, and perceived knowledge of performance (see Paper I). In the process of revising the PTF, the perceived positive specific feedback subscale was excluded. New items assessing both positive (3 items, e.g., "In response to a good performance the teacher smiles") and negative perceived nonverbal feedback (3 items, e.g., "In response to a poor performance the teacher looks angry") were added to the PTF. These items were taken from previously used nonverbal feedback categories in the questionnaire version of the CBAS (Allen & Howe, 1998) and were modified for the physical education setting. Further, two items were added to the perceived positive general feedback subscale ("If the teacher sees that I try very hard, I'll always get praise", and "The teacher praises me even though I don't deserve it") and one item to the perceived knowledge of performance subscale ("After the performance the teacher instructs me immediately") in order to expand these constructs. Therefore, this expanded version of the PTF contained 14 items. Response choices ranged from 1 (strongly disagree) to 5 (strongly agree). Items are presented in Table 3.

Modified version of the Sport Motivation Scale (SMS)

To measure students' intrinsic motivation the modified version of the SMS was used that was adapted to physical education setting and translated into Estonian by Hein et al. (2004). Responses were made following the presentation of the common stem "I take part in physical education classes, because...". In the present study three intrinsic motivation subscales, intrinsic motivation to know (4 items, e.g., "For the pleasure it gives me to know more about physical exercises"), intrinsic motivation to accomplish (4 items, e.g., "For the pleasure I feel while improving some of my weak points"), and intrinsic motivation to experience stimulation (4 items, e.g., "For the excitement I feel when I am really involved in the activity") were used. Considering the results of an initial confirmatory factor analysis that did not reach acceptable fit with the data, and due to the low factor loadings and high measurement errors for some items, Hein et al. (2004) removed one item from each intrinsic motivation subscale.

After these modifications the confirmatory factor analysis supported the re-specified three-factor model of the modified SMS and fit indices indicated a good fit of the model to the data ($\chi^2(24) = 47.3$, NFI = .94, NNFI = .93, CFI = .95, GFI = .95, AGFI = .90, RMSEA = .05). Cronbach alpha coefficients for the subscales of intrinsic motivation to experience stimulation, to know and to accomplish in the present study were .82, .81, .79, respectively.

Paper IV.

Perceived threat to sense of self from the PELES (Mitchell, 1996).

The perceived threat subscale asked students to indicate how positive or negative they felt about themselves in physical education lessons. Lower scores represented lower perceptions of threat.

Perceived positive general feedback from the original version of the PTF.

Items in the perceived positive general feedback subscale asked students to indicate the extent to which they perceived their teacher provided them with positive feedback such as praise after their performance in physical education.

Students responded to the questionnaires on two occasions over a two-year period.

4.3. Procedure

Permissions to carry out the studies were obtained from the headmaster or from class teachers in each school. Questionnaires were administered in classroom conditions. The researchers emphasized to the participants that all the questionnaires were designed to measure students' general feelings about physical education classes and not about the one particular class. It means that each item in the questionnaire was worded to reflect students' general levels of perceptions in physical education without reference to any particular lesson. The questionnaire took approximately 12–15 min to complete. Students were assured that their answers would remain confidential. The completed questionnaires were collected by the researcher.

4.4. Statistical analysis

The appropriate procedures in the Statistica, SPSS 10.0, and LISREL 8.51 computer programs were used. Raw data were screened and multiple imputation was used to replace missing observations with a score from another case with a similar profile of scores across other variables (Jöreskog & Sörbom, 1996). The outliers were determined by the range of ± 3 standard deviations of the observed variables away from the means of computed corresponded subscale variables

and were considered for case exclusion. The results were presented as mean values (M) \pm standard deviation (SD).

Pearson product correlation analysis was used to study relationships between study variables (Paper I, III). Multiple regression analyses was used to determine whether the different types of perceived teacher feedback and dimensions of perceived learning environment might predict intrinsic motivation and components of intrinsic motivation (Paper I).

A multivariate analysis of variance (MANOVA) with subsequent post hoc Tukey HSD tests were performed to identify differences in the different types of perceived teacher feedback, dimensions of perceived learning environment, and intrinsic motivation in physical education between groups of students with different levels of sport participation in their leisure time after school hours (Paper II).

To test the structural integrity of the modified and revised version of the PTF, the final sample after excluding outliers (N = 625) was randomly split to produce two subsamples, one for an exploratory factor analysis (n = 306), and other for a confirmatory factor analysis (n = 319). A maximum likelihood method for the exploratory factor analysis was conducted to establish the structural construct for the revised PTF. The factorial validity of the revised version of the PTF was tested with confirmatory factor analysis using LISREL 8.51 (Paper III). The internal consistency of all subscales was assessed by Cronbach's alpha.

Structural equation modeling procedures were used to test the effect of both verbal and nonverbal types of perceived teacher's feedback on students' intrinsic motivation (Paper III), and stability of the perceived positive general feedback and perceived threat to sense of self and the causal relationship between them in physical education (Paper IV).

All confirmatory factor analyses and structural equation modeling procedures were conducted with maximum likelihood procedures, using a polychoric correlation matrix and its asymptotic covariance matrix as data input provided by PRELIS 2.51, a companion program to LISREL 8.51. Goodness of fit of the proposed models with the data was assessed by examining the chi-square statistic, the Goodness of Fit Index (GFI), the Comparative Fit Index (CFI), the Non-Normed Fit Index (NNFI), the Incremental Fit Index (IFI), and the Root Mean Square Error of Approximation (RMSEA). The GFI and RMSEA are also referred to as absolute fit indices and the CFI, NNFI, and IFI as incremental fit indices (Kline, 1998). These indices were selected following the recommendation of Hu and Bentler (1995) who suggested using multiple indices representing absolute and incremental fit measures. According to Bentler (1990), cut-off values for GFI, CFI, IFI, and NNFI greater than .90 are typically taken to reflect an acceptable fit, whereas for RMSEA, values of .05 or less indicate a close fit. Later, however, Hu and Bentler (1999) have noted that values approaching .95 for GFI, CFI, IFI, and NNFI are considered preferable.

5. RESULTS

5.1. Perceived teacher's feedback, dimensions of perceived learning environment, and intrinsic motivation in physical education (Paper I)

Table 1 shows descriptive statistics and correlation coefficients between different types of perceived teacher's feedback, dimensions of perceived learning environment, intrinsic motivation as well as the components of intrinsic motivation. The perceived positive general feedback and perceived knowledge of performance were positively related to a total score across the intrinsic motivation scales and also to all individual components of intrinsic motivation. The perceived positive specific feedback had positive significant relationship only with effort-importance. The perceived challenge and perceived threat to sense of self correlated positively with intrinsic motivation as well as the components of intrinsic motivation. More detailed correlation matrix can be found in Paper I (Table 3).

Table 1. Descriptive statistics and correlations between different types of perceived teacher feedback, dimensions of learning environment, intrinsic motivation and components of the intrinsic motivation (n = 699).

	Perceived competence	Interest-enjoyment	Effort-importance	Intrinsic motivation	Mean	SD
Perceived challenge	.203*	.539*	.661*	.572*	4.16	.91
Perceived threat	.588*	.338*	.172*	.375*	4.02	.60
PPSF	-.044	-.025	.101*	-.009	3.43	.70
PPGF	.376*	.477*	.362*	.478*	3.01	.79
PKP	.109*	.365*	.262*	.327*	2.78	.89
Mean	5.05	5.05	5.08	5.03		
SD	1.04	1.48	1.16	.88		

Note. Subscales of the PTF; PPSF = perceived positive specific feedback; PPGF = perceived positive general feedback; PKP = perceived knowledge of performance. Perceived feedback and learning environment subscales means are on a 5-point scale. Means of the components of intrinsic motivation and the total score of the intrinsic motivation are on a 7-point scale.

*p < .001.

In order to establish the extent to which the dimensions of the perceived learning environment and different types of perceived feedback predict students' intrinsic motivation, four separate hierarchical regression analyses were performed. Results are presented in Table 2. From the three perceived feedback variables, positive general feedback was a significant predictor for all observed dimensions of intrinsic motivation, especially for perceived competence and

interest-enjoyment, as well as for total score of intrinsic motivation. Perceived challenge was the most important predictor of interest-enjoyment, effort-importance, and total score of intrinsic motivation, whereas the perceived threat to sense of self revealed to be more essential for perceived competence.

Table 2. Increments in R^2 values from multiple regression analyses for intrinsic motivation and components of intrinsic motivation.

	Perceived competence $F(4,722) = 102.3$	Interest- enjoyment $F(5,733) = 119.5$	Effort- importance $F(3,726) = 204.9$	Intrinsic motivation $F(4,701) = 165.2$
Perceived challenge	.011**	.290**	.428**	.326**
Perceived threat	.353**	.100**	.023**	.123**
PPSF	–	.009*	–	.005*
PPGF	.043**	.041**	.005*	.031**
PKP	.004*	.004*	–	–
Total R^2	.422	.449	.457	.485

Note. Subscales of the PTF; PPSF = perceived positive specific feedback; PPGF = perceived positive general feedback; PKP = perceived knowledge of performance. * $p < .05$, ** $p < .001$.

5.2. The effect of leisure-time sport participation on perceived teacher feedback, perceived learning environment, and intrinsic motivation in physical education (Paper II)

A multivariate analysis of variance (MANOVA) was performed with the three groups of boys and three groups of girls separately (boys not in organised sport = Group 1, boys in organised sport for up to two years = Group 2, and boys in organised sport for more than two years = Group 3; girls not in organised sport = Group 4, girls in organised sport for up to two years = Group 5, and girls in organised sport for more than two years = Group 6) as the independent variables and mean scores on different types of perceived teacher’s feedback, dimensions of perceived learning environment, and intrinsic motivation as dependent variables. There was no overall multivariate effect for boys, Wilks’s lambda = .95, Raos’s $R(12, 650) = 1.45$, $p < .138$, but for girls there was an overall multivariate effect, Wilks’s lambda = .89, Raos’s $R(12, 716) = 3.36$, $p < .0001$.

Subsequent Post hoc Tukey HSD for unequal N multiple comparisons tests revealed that boys who had participated in sport for more than two years in their leisure time scored significantly higher on intrinsic motivation than boys who had not participated in sport. Similarly, girls who had participated in organised sport for more than two years and girls involved in sport for up to two years were significantly more motivated to participate in physical education than girls who had not participated in organised sport in their leisure time (Figure 1, Paper II).

The three boys groups did not differ on the different types of perceived teacher's feedback, but girls who had participated in organised leisure-time sport for up to two years and girls involved in sport for more than two years had significantly higher perceptions that teachers gave them positive general feedback than girls without leisure-time sport experiences (Figure 2, Paper II).

With regard to dimensions of perceived learning environment, boys who had participated in organised leisure-time sport for more than two years and boys who had participated in sport for up to two years perceived the learning environment to be significantly less threatening to their sense of self than boys who had not participated in sport (note that higher score represents lower perception of perceived threat). An analogous pattern was found for girls. The girls who had participated in sport for more than two years and girls who had participated in sport for up to two years also perceived physical education to be significantly less threatening to their sense of self than girls who had not participated in organised leisure-time sport (Figure 3, Paper II).

5.3. Revision and extension of the Perception of the Teacher's Feedback (PTF) (Paper III)

To establish construct validity of the revised PTF an exploratory factor analysis was conducted with the first subsample ($n = 306$) from the total sample size ($N = 625$). A maximum likelihood method for the exploratory factor analysis with varimax rotation yielded a four-factor model accounting for 51.9% of the variance. A minimal loading of .40 was used as the criterion value in the interpretation of these factor loadings. The items of the revised PTF and the results of the exploratory factor analysis are reported in Table 3. Examination of the factor loadings indicated that items loading highly on Factor 1 described the perceptions of positive general teacher feedback such as praising, encouraging, and smiling. However, item 4 ("In response to a good performance the teacher smiles") loaded on an unexpected factor, and for the clarification of the construct validity of this factor the item was excluded. Further, item 6 ("After the performance the teacher instructs me immediately") loaded across two factors and was therefore eliminated from the study at this point. Item 3 ("When I do well in phys. ed., the teacher confirms that") loaded also on two factors, however, subsequent CFA showed that this item is related to Factor 2. After these modifications Factor 1 comprised 3 items labeled perceived positive general feedback.

Examination of the items loading on Factor 2 described the perceptions of teacher's feedback, which can be classified as information about students' performance and was thus labeled perceived knowledge of performance.

Factor 3 represented perceptions of praise in response to a good performance that was mostly nonverbal and was thus labeled perceived positive nonverbal feedback. This factor contained 3 items, 2 of which were nonverbal

praise and third was verbal praise (Item 11, “The teacher praises me even though I haven’t deserved it”). In order to clarify the construct validity of this factor item 11 was eliminated from the study.

Finally, factor 4 was composed of 3 items and represented perceptions of critical teacher’s feedback after a poor performance that was nonverbal and was thus labeled perceived negative nonverbal feedback.

Table 3. Factor-analytic results for the revised PTF.

Items	F1	F2	F3	F4
1. My work is frequently encouraged by the teacher	.77	.23	.13	-.11
2. The teacher often praises me	.72	.16	.17	-.17
3. When I do well in physical education, the teacher confirms that	.46	.46	.19	-.10
4. In response to a good performance the teacher smiles	.71	.21	.12	.01
5. If the teacher sees that I try very hard, I’ll always get praise	.64	.27	.13	-.06
6. After the performance the teacher instructs me immediately	.41	.42	.25	-.06
7. In response to a poor performance the teacher rolls his/her eyes	-.02	-.06	.00	.71
8. In response to a poor performance the teacher shakes his/her head	-.05	.03	.09	.63
9. In response to a poor performance the teacher looks angry	-.16	-.08	.00	.63
10. In response to a good performance the teacher claps	.07	.02	.85	.02
11. The teacher praises me even though I don’t deserve it	.30	.16	.50	-.05
12. In response to a good performance the teacher pats me on the back	.18	.23	.55	.21
13. The teacher often gives me instructions/feedback	.25	.66	.12	-.02
14. The teacher instructs me frequently during the performance	.27	.77	.09	-.06
Eigenvalue	2.7	1.7	1.5	1.4
Percent variance	19.2	12.1	10.5	10.1

Cronbach alpha coefficients for the subscales of perceived positive general feedback, perceived knowledge of performance, perceived positive nonverbal feedback, and perceived negative nonverbal feedback were .80, .75, .65, and .73 respectively. The majority of subscales demonstrated coefficients greater than .70, indicating an acceptable level of internal consistency (Nunnally, 1978). However, the Cronbach alpha coefficient of the subscale of perceived positive nonverbal feedback was .65. Since the alpha coefficient did exceed a level of .60, which has been identified as an acceptable, albeit marginal, level of reliability for subscales with a small number of items but with a demonstrated strong underlying factor structure (Smith et al., 1995), the subscale was retained. However, caution should be used in the interpretation of results pertaining to this subscale.

To test the four-factor structure of the revised PTF, confirmatory factor analysis was used. The confirmatory factor analysis was conducted with the second subsample (n = 319) taken from the total sample size. The goodness-of-fit indices of the confirmatory factor model revealed an acceptable fit: $\chi^2(38) = 66.3$, χ^2/df ratio = 1.74, GFI = .93, CFI = .93, IFI = .94, NNFI = .91, RMSEA = .05, confidence interval for RMSEA = .03–.06. Confirmatory factor model is presented in Figure 1.

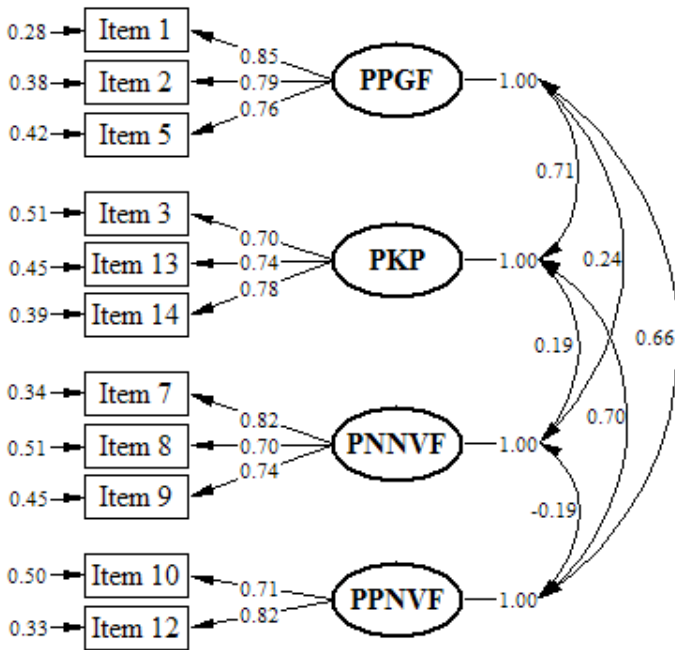


Figure 1. Confirmatory factor model for the revised PTF. *Note.* PPGF = perceived positive general feedback; PKP = perceived knowledge of performance; PPNVF = perceived positive nonverbal feedback; PNNVF = perceived negative nonverbal feedback.

5.4. The effect of both perceived verbal and nonverbal teacher feedback on intrinsic motivation in physical education (Paper III)

Table 4 shows descriptive statistics and correlation coefficients between both verbal and nonverbal types of perceived teacher’s feedback from the revised PTF and three types of intrinsic motivation from the modified Sport Motivation Scale. Perceived positive general feedback, perceived knowledge of performance, and perceived positive nonverbal feedback had significant positive relationships, whereas perceived negative nonverbal feedback had significant negative relationships with all three types of intrinsic motivation. The three types of intrinsic motivation were strongly correlated to each other (coefficients ranging from .65 to .69). Findings were consistent with Brière et al. (1995) and Pelletier et al. (1995) and was expected because they all measured related constructs (i.e., intrinsic motivation). Such correlations indicate that the three subscales assess similar but not identical construct (Pelletier et al., 1995). Also, according to Amorose and Horn (2000), correlation coefficients below .70

indicate that multicollinearity should not be considered an issue. However, averaged scores of the three types of intrinsic motivation were used to characterize a global intrinsic motivation factor. Also, averaged scores of each perceived feedback types were used.

Table 4. Descriptive statistics and correlations among the subscales of the revised PTF and three types of intrinsic motivation from the modified SMS.

	M	SD	1	2	3	4	5	6	7
PPGF	2.86		(.80)						
PKP	2.81	.79	.56	(.75)					
PPNVF	1.91	.75	.39	.40	(.65)				
PNNVF	2.08	.78	-.19	-.14	.11	(.73)			
ES	3.89	1.41	.41	.34	.26	-.11	(.82)		
AC	4.80	1.38	.37	.31	.11	-.13	.65	(.79)	
KN	4.77	1.38	.40	.34	.19	-.15	.68	.69	(.81)

Note. Cronbach alphas of each subscale are presented on the diagonal; correlations of .11 and above are significant, $p < .001$. PPGF = perceived positive general feedback; PKP = perceived knowledge of performance; PPNVF = perceived positive nonverbal feedback; PNNVF = perceived negative nonverbal feedback; ES = intrinsic motivation to experience stimulation; AC = intrinsic motivation to accomplish; KN = intrinsic motivation to know. Perceived feedback means are on a 5-point scale. Three types of the intrinsic motivation means are on a 7-point scale.

Structural equation modelling was used to examine the effect of both perceived verbal and nonverbal teacher feedback on students’ intrinsic motivation. The hypothesized structural model specified a direct effect of perceived positive general feedback, perceived knowledge of performance, perceived positive nonverbal feedback and perceived negative nonverbal feedback on global intrinsic motivation factor. The goodness of fit of the initial and re-estimated structural equation models are reported in Table 5 (Model 1 and Model 2, respectively), and the re-estimated structural model is shown in Figure 2.

Table 5. Goodness of fit statistics for the estimated structural equation models.

Models	χ^2/df	p-value	GFI	CFI	NNFI	IFI	RMSEA	Confidence interval for RMSEA
Model 1:	23.2/8	.003	.99	.99	.97	.99	.06	.03–.08
Model 2:	3.5/4	.475	1.00	1.00	1.00	1.00	.00	.00–.06

Note. Model 1 = structural equation modeling of perceived teacher feedback and intrinsic motivation; Model 2 = modification of the structural equation modeling of perceived teacher feedback and intrinsic motivation.

The results of the initial structural equation model showed that students' intrinsic motivation in physical education was significantly predicted by perceived positive general feedback (standardized coefficient = .35, with 95 percent confidence intervals (CI₉₅) = .25 to .46) and perceived knowledge of performance (standardized coefficient = .19, CI₉₅ = .09 to .28), whereas the association with perceived positive nonverbal feedback (standardized coefficient = .02, CI₉₅ = -.06 to .11) and perceived negative nonverbal feedback (standardized coefficient = -.07, CI₉₅ = -.15 to .01) were not statistically significant. Thus, the two types of perceived teacher's feedback accounted for 26% of the variance in intrinsic motivation.

Further, the subscales of perceived positive nonverbal feedback and perceived negative nonverbal feedback were excluded from the structural model since they did not exhibit a statistically significant relationship with intrinsic motivation. The results of the re-estimated model showed that the proportions of unexplained variance in the structural model did not change, remaining the same at 26 percent (see Figure 2). The goodness of fit statistics improved, especially RMSEA (see Table 5, Model 2). The values of standardized coefficient of perceived positive general feedback (standardized coefficient = .37, CI₉₅ = .27 to .47) and perceived knowledge of performance (standardized coefficient = .20, CI₉₅ = .10 to .29) were somewhat different from those reported in the initial model. However, the overlap of confidence intervals for both variables may follow. This also provides evidence that the exclusion of perceived positive nonverbal feedback and perceived negative nonverbal feedback from the model did not attenuate these paths. Thus, the perceived positive general feedback was the strongest predictor of intrinsic motivation in physical education beyond the perceived knowledge of performance.

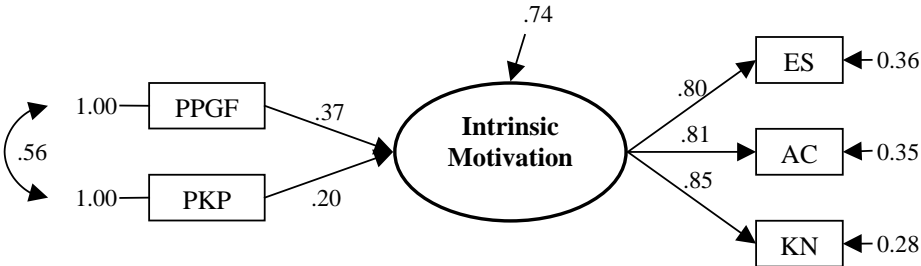


Figure 2. Structural model for perceived teacher feedback and intrinsic motivation. *Note.* PPGF = perceived positive general feedback; PKP = perceived knowledge of performance; ES = intrinsic motivation to experience stimulation; AC = intrinsic motivation to accomplish; KN = intrinsic motivation to know.

5.5. Stability and causal nature of perceived positive general feedback and perceived threat to sense of self in physical education over a two-year period (Paper IV)

Table 6 shows descriptive statistics for the items of perceived positive general feedback and perceived threat to sense of self for both time points over a two-year period.

Table 6. Descriptive statistics of the observed variables for Time 1 and Time 2 data collection (n = 294).

	Time 1		Time 2	
	M (α)	SD	M (α)	SD
<i>Perceived positive general feedback</i>	(.68)		(.74)	
1. My work is frequently encouraged by the teacher	3.09	.95	2.91	1.06
2. The teacher often praises me	2.99	.92	2.95	1.04
3. When I do well in physical education, the teacher confirms that	3.39	1.07	3.10	1.04
<i>Perceived threat to sense of self</i>	(.66)		(.68)	
1. I feel useless in physical education classes	1.81	.90	1.74	.94
2. I get worried that I will look stupid in physical education	2.09	1.02	1.85	.94
3. Physical education makes me feel bad about myself	1.71	.89	1.67	.85

Note. α = cronbach alpha; cronbach alphas for each subscales are presented in the parenthesis.

Prior to testing the stability effects and causal nature of the relationship between perceived positive general feedback and perceived threat to sense of self, a series of two-step confirmatory factor analysis models were conducted, as suggested by Mulaik & Millsap (2000), to establish whether the perceived positive general feedback and perceived threat to sense of self constructs would display discriminant validity at both time points.

In the first step, discriminant validity between perceived positive feedback and perceived threat were examined through the specification of a model in which items of the respective latent constructs were set to load on their expected factors. Therefore, a two-factor measurement model was tested in which the separate latent constructs of perceived positive general feedback and perceived threat to sense of self were set to correlate. In the second step, a congeneric confirmatory factor analysis model was estimated in which a single factor would explain the relationships between the items of perceived positive general feedback and perceived threat to sense of self. Discriminant validity of the measures is supported if the measurement confirmatory factor analysis model that assume discriminant validity meet the proposed values for indices of good

fit and are superior in fit to the congeneric confirmatory factor analysis model. The two-step process was followed to test the discriminant validity of the perceived positive general feedback and perceived threat to sense of self at both time points, a total of four analyses.

Goodness of fit indices for the series of congeneric and discriminant validity models at both time points are given in Table 7. Each of the discriminant validity models met the criteria for an adequate fit and were superior in fit to the congeneric models at both time points. These analyses support the discriminant validity of two differentiated measures of perceived positive general feedback and perceived threat to sense of self.

Table 7. Goodness of fit statistics for congeneric and discriminant validity confirmatory factor analytic models.

Model	χ^2/df	p-value	CFI	NNFI	RMSEA
Congeneric, Time 1	109.87/9	.000	.70	.51	.196
Discriminant, Time 1	4.42/8	.817	1.00	1.00	.000
Congeneric, Time 2	171.58/9	.000	.55	.25	.248
Discriminant, Time 2	14.21/8	.077	.96	.93	.051

Structural equation modelling was used to examine the stability effects and the causal nature of relationship between perceived positive general feedback and perceived threat to sense of self over a two-year period. To examine the stability of the perceived positive general feedback and perceived threat to sense of self over a two-year period, the hypothesized structural model specified direct effects of both perceived positive general feedback and perceived threat to sense of self measured at Time 1 on themselves measured two years later (Time 2). To test the causal nature of the relationships between perceived positive general feedback and perceived threat to sense of self, the hypothesized structural model specified reciprocal cross-lagged effects between perceived positive general feedback and perceived threat to sense of self across time. Finally, in the hypothesized structural model the relationship between perceived positive general feedback and perceived threat to sense of self were set to correlate at both time points in order to test the stationarity of the relationship between these two constructs over a two-year period.

The longitudinal structural model and structural coefficients are shown in Figure 3. The goodness of fit indices revealed an acceptable fit of the model to the data and were as follows: $\chi^2(48) = 54.82$, χ^2/df ratio = 1.14, $p > .231$, CFI = .93, NNFI = .93, RMSEA = .022. The longitudinal structural model indicate that students demonstrated high degree of stability in perceptions of threat to their sense of self in physical education from Time 1 to Time 2 (path coefficient = .62, $CI_{95} = .40$ to .84, $p < .01$). With respect to perceived positive feedback,

students did not demonstrate a high degree of stability over time (path coefficient = .24, $CI_{95} = .04$ to $.36$, $p < .01$) compared to perceived threat to sense of self. Focusing on the cross-lagged relationships, only the path from perceived threat to sense of self to perceived positive general feedback exhibited a modest but significant cross-lagged standardised coefficient (path coefficient = $-.20$, $CI_{95} = -.39$ to $-.01$, $p < .01$) between Time 1 and Time 2. Focusing on Time 1, it can be seen that students' perceptions of threat to sense of self and perceived positive general feedback were strongly and negatively related. However, the relationship between these two variables at Time 2 was also negative but not significant, indicating that relationship between perceived threat and perceived positive feedback was not stationary over time.

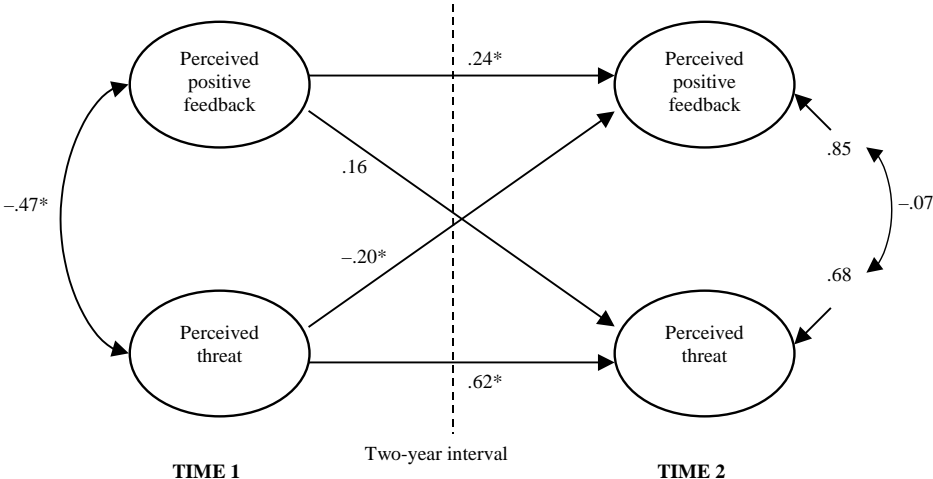


Figure 3. Path analysis showing relationships between perceived positive general feedback and perceived threat to sense of self in physical education across time. *Paths are significant at $p < .01$.

6. DISCUSSION

6.1. Validity and reliability of the measures (Paper I, III)

This study was conducted to develop a valid and reliable instrumentation to measure students' perception of the teachers' feedback (PTF) in physical education (Paper I and Paper III), and retest the construct validity of the Physical Education Learning Environment Scale (PELES) initially developed by Mitchell (1996) (Paper I).

6.1.1. Perception of the Teacher's Feedback (PTF)

In Paper I, the construct validity of the PTF was supported by the results of both exploratory factor analysis and confirmatory factor analysis. A stable, three-factor solution emerged, implying to the existence of factors of perceived positive specific feedback, perceived positive general feedback, and perceived knowledge of performance. All the three subscales exhibited satisfactory internal consistency and temporal stability over a one-week period. In the sport domain, researchers have developed questionnaires to assess athletes' perceptions of feedback provided by their coaches (Allen & Howe, 1998; Amorose & Horn, 2000; Black & Weiss, 1992). Amorose and Horn (2000), for example, developed the Coaching Feedback Questionnaire (CFQ) as a questionnaire version of the Coaching Behavior Assessment System (CBAS, Smith et al., 1977). In the Amorose and Horn's (2000) study, the three factors emerged in the exploratory factor analysis that accounted for 49.8% of variance in the original data. The three-factor model of the PTF, however, accounted for 61.2% of the variance (see Table 2, Paper I).

Acknowledging the importance of nonverbal forms of feedback (Martens, 1987; Martens, 1997; Yukelson, 1998), two subscales of nonverbal teacher feedback (perceived negative nonverbal feedback and perceived positive nonverbal feedback) were added to the PTF (Paper III). Results of the exploratory factor analysis indicated that one nonverbal praise item (Item 4, "In response to a good performance the teacher smiles", see Table 3) loaded onto the perceived positive general feedback factor and one verbal praise item (Item 11, "The teacher praises me even though I haven't deserve it", see Table 3) loaded onto the perceived positive nonverbal feedback factor suggesting that praise, whether it is verbal or nonverbal, was viewed similarly by these adolescents. This is consistent with the work of Allen and Howe (1998) who found that female adolescent field hockey players viewed coaches' verbal and nonverbal positive feedback similarly. However, when these two items and one another item (Item 6, "After the performance the teacher instructs me immediately", see Table 3) were removed in order to clarify the construct validity of

the instrument, the confirmatory factor analysis supported the produced four-factor model of the revised PTF. An explanation for the removing item 6 may be that it was difficult for students to respond to this item as the teachers may not give instructions immediately after a performance. Teachers probably allow a few seconds to recover from and reflect on the performance — perhaps to evaluate internal feedback first — before they offer advice. Sharp (1992) has also suggested a general guide for teachers to “count to ten” before giving feedback. Therefore, it may be wise to consider rewording this item in future studies.

Initial attempts to examine athletes’ perceptions of their coaches’ nonverbal feedback in sport domain have been conducted by Allen and Howe (1998), Crocker (1990), and Kenow and Williams (1992). These studies have indicated that athletes really “see” and interpret the nonverbal behaviours exhibited by their coaches. Results of the present study indicated that the same is evident about students in school physical education setting. Specifically, as revealed from both exploratory and confirmatory factor analysis, students seem to distinguish between nonverbal and verbal forms of feedback and are able to interpret the nonverbal negative feedback such as a teacher’s angry look after a poor performance in physical education. Thus, it seems reasonable to continue exploring both verbal and nonverbal types of perceived feedback that teachers may display and to assess their impact on students’ psychological outcomes such as intrinsic motivation in physical education.

In conclusion, the results provided support for the reliability and validity of the revised PTF for measuring both perceived verbal and nonverbal teacher feedback in a population of Estonian middle and high school students in physical education (Paper III).

6.1.2. Physical Education Learning Environment Scale (PELES)

Mitchell (1996) developed the PELES for assessing students’ perceptions of the learning environment in physical education. In their comprehensive review of motivational climate in physical activity, Ntoumanis and Biddle (1999), however, indicated that the validation process of the PELES was inadequate and further testing is mandatory before it can be regarded a valid instrument. They suggested that the more vigorous technique of confirmatory factor analysis should be used to supplement the traditional exploratory factor analysis to examine the factor structure of the PELES. Therefore, both an exploratory factor analysis and confirmatory factor analysis were conducted in the present study to retest the construct validity of the instrument (Paper I).

In this study (Paper I), a three-factor solution emerged from the exploratory factor analysis and the confirmatory factor analysis indicated that imposing the hypothesised model on a second sample of data produced an acceptable fit. This confirmed the three-factor structure of the PELES. In Mitchell’s (1996) study, a

three-factor solution accounted for 53% of the variance. In the present study, a three-factor solution revealed a similar result accounted for 58.1% of the variance. Furthermore, the per cent of variance accounted for by each factors were also similar with Mitchell's study (1996). In our study the per cent of variance accounted for by perceived challenge, perceived threat, and perceived competitiveness factors were 27.9%, 18.8%, and 11.4%, respectively (see Table 1, Paper I), whereas in Mitchell's study (1996) they were 26%, 16%, and 11%, respectively. The α -coefficient for perceived challenge and perceived threat to sense of self subscales exceeded the minimal criteria of .60 for measure of internal consistency. The low reliability of the perceived competitiveness subscale (.57) did not allow its inclusion in subsequent analysis. This is not consistent with Mitchell's (1996) research. The present study (Paper I) seemed to indicate that in respect of perceived competitiveness, students viewed the learning environment differently. Therefore, it was suggested to consider re-wording the items regarding the subscale of perceived competitiveness in future studies with children, such as 'Sometimes in physical education classes we compete against each other' instead of wording 'In physical education classes we compete against each other'. It might be favourable to eliminate the possibility to view the learning environment either as completely competitive or completely non-competitive. The elimination of perceived competitiveness from the current study was substantiated by Mitchell's work because he, too, did not consider perceived competitiveness a significant predictor of intrinsic motivation. Furthermore, several researchers have confirmed that a competitive learning environment may diminish and hinder students' intrinsic motivation (Deci & Olson, 1989; Vallerand et al., 1987).

In conclusion, results supported the three-factor structure of the PELES (Mitchell, 1996) and thus may be considered as a valid measure for assessing students' perceptions of the learning environment in physical education.

6.2. Relationships between perceived teacher feedback and intrinsic motivation (Paper I, III)

Results of the present study provided support for the basic tenets of cognitive evaluation theory (Deci & Ryan, 1985, 1991), suggesting that social factors such as feedback from significant others that conduce towards feelings of competence and self-determination during activity can enhance intrinsic motivation for that particular activity.

Results indicated that students' perceptions of positive general feedback predicted students' perceived competence, interest-enjoyment, and intrinsic motivation (Paper I). This finding supports the positive link between teacher feedback and perceived competence that has been suggested by several authors in physical domain (Amorose & Smith, 2003; Amorose & Weiss, 1998; Goudas

et al., 2000; Horn, 2004; Horn & Amorose, 1998; Weiss & Amorose, 2005). This suggests that teachers who provide more positive general feedback are more likely to be successful in facilitating children's intrinsic motivation in physical education because such teacher behaviour enhances both children's perception of competence and their interest to physical activity. The positive correlation coefficient between the subscales of perceived knowledge feedback and interest-enjoyment (see Table 1) suggests the possibility that the children are more involved in exercise in physical education classes if they feel they are provided with feedback providing knowledge of how to perform exercise.

Results from the structural equation modelling analysis, a more advanced statistical technique which is free from measurement error in the observed or manifest variables, also indicated that students' perceptions of positive general teacher feedback represent potent determinant of students' intrinsic motivation in physical education, beyond the perceptions of teacher feedback about the knowledge of performance (Paper III). These findings are in line with previous studies in sport contexts (Amorose & Horn, 2000; Black & Weiss, 1992), suggesting that coaches who frequently provide positive and encouraging and information-based performance feedback and seldom ignore players' success may create an environment that facilitates the development of intrinsic motivation in their athletes. Although their research was focused on the organised sport domain and with coaches' feedback, it compares favourably with physical education classes and teachers' feedback.

Surprisingly, the results of the structural equation modeling revealed that the association of perceived positive and perceived negative nonverbal feedback with intrinsic motivation was not statistically significant (Paper III). An explanation for the non-significant effect of perceived nonverbal feedback on intrinsic motivation may be that teachers obviously provide only a little amount of nonverbal praise and criticism about students' performance in physical education. This is consistent with our hypothesis that students' perceptions of the nonverbal criticism have no effect or have negative effect on intrinsic motivation in physical education. Allen and Howe (1998) in sport domain found that coach's nonverbal criticism also did not contribute significantly to athletes' psychological outcome such as perceived competence. Correlational analyses in the present study revealed, however, that perceived negative nonverbal feedback was negatively associated with three types of intrinsic motivation (see Table 4). Also, Deci and Ryan's (1985, 1991; Ryan & Deci, 2000) cognitive evaluation theory and general self-determination theory states that events that bear negative influences on individual's perceptions of competence, autonomy, and relatedness will likely undermine their intrinsic motivation.

In conclusion, results supported the hypothesis of cognitive evaluation theory of Deci and Ryan (1985, 1991; Ryan & Deci, 2000), implying that high frequencies of perceived positive and information-based feedback were related to higher levels of perceived competence, interest-enjoyment, and intrinsic motivation. This suggests that teachers should increasingly provide positive

general feedback to enhance students' perceived competence and ultimately intrinsic motivation to engage in physical education. Teachers should also consider that students' perceptions of feedback about the knowledge of performance may also be essential for increasing intrinsic motivation in physical education. In acknowledgement of the importance of nonverbal forms of feedback (Martens, 1987; Martens, 1997; Yukelson, 1998) teachers are encouraged to increase their positive responses to students' performances in the form of nonverbal feedback.

6.3. Relationships between perceived learning environment and intrinsic motivation (Paper I)

According to Deci and Ryan (1985), Ryan and Deci (2000), and Mitchell (1996), perceptions of optimal challenge and non-threatening environment are particularly important for enhancing children's perceived competence and intrinsic motivation. The results of the present study also showed that perceived challenge and perceived threat to sense of self were the best predictors of intrinsic motivation, whereas the perceived threat to sense of self was found to be a more important predictor for perceived competence than perceived challenge in physical education (Paper I). In other words, students' perception of competence and intrinsic motivation is likely to be high when they perceive a learning environment to be non-threatening to their sense of self and physically challenging.

In order to ensure students' positive perceptions towards their competence or ability and thereby increase their intrinsic motivation, according to Weiss (1987) and Feltz (1988), teachers should continually provide experiences enabling students to feel more successful. Mitchell (1996) has argued that for most students, repeated experiences of success should lead to a more positive feeling of self-worth and a lower perception of threat to one's sense of self. Given that low perceived threat was the strongest predictor of perceived competence in our study (see Table 2), teachers should ensure that students are continually provided with successful experiences in physical education. Bandura and Schunk (1981) have also contended that experiencing failure is conducive to lower levels of intrinsic motivation, while success promotes intrinsic motivation. However, one should also be aware of the danger lurking in possible misinterpretations of these issues. Since the physical education teachers want their students to experience success to enhance their perceived ability and thereby intrinsic motivation, they may set tasks that are too easy for them. Easy tasks, however, are not recommended, because as our study showed, perceived challenge was a primary predictor of intrinsic motivation. Furthermore, students might attribute success in performing easy tasks to the simplicity of the task rather than to their own ability. Another mistake that can be done on

the part of teachers may be setting tasks that are too difficult, which in turn can result in either boredom or anxiety.

Deci and Ryan (1985) have argued that two conditions must be present for intrinsic motivation to be affected by perceived competence. Not only the task at hand must represent an optimal challenge, but individual must also feel that their efforts affect outcomes. Alternatively stated, the activity has to present a worthy challenge, and progress in particular activity must be seen by the individual to result from his or her own efforts. Results of our study revealed that perceived challenge was an important predictor for perceived effort-importance, suggesting that when students see the task optimally challenging they are more likely to be willing to exert more effort.

In conclusion, the results of this study supported the fundamental premise of cognitive evaluation theory (Deci & Ryan, 1985, 1991; Ryan & Deci, 2000) that optimal challenge and non-threatening environment are important for high level of intrinsic motivation. Therefore, teachers should provide students with successful experiences and set optimally-challenging tasks. They need to create a learning environment that leads students to perceive it as non-threatening and challenging. Students holding the afore-mentioned perceptions of the environment are likely to exhibit higher levels of perceived competence and intrinsic motivation.

6.4. The effect of leisure-time sport participation on perceived teacher feedback, perceived learning environment, and intrinsic motivation in physical education (Paper II)

The results of the present study supported the existing evidence (Anderssen, 1993; Goudas et al., 2001) that students' intrinsic motivation in physical education classes differs depending on whether they participate in sports in their leisure time after normal school hours (Paper II). Both male and female students with sport experience reported significantly higher ratings on intrinsic motivation than students without sport experience. Goudas et al. (2001), for example, indicated that Greek secondary school students with sport experience reported significantly higher scores on intrinsic motivation, perceived competence, and outcome expectancies than students with limited sport experience. They argued that either Greek physical education favours students who are familiar with sports or these students are those who are motivated in the first place. Probably this is also the case with Estonian school students.

Results of the study indicated that girls with sport experience had higher perceptions that teachers gives them positive general feedback than girls with limited sport experience. It seems that higher levels of motivation and a general positive attitude toward school physical education results in them perceiving their teacher's behaviour as more friendly. A parallel can be drawn between the

results of this study and the work of Amorose and Horn (2000), although their research was focused on the organised sport domain alone. They concluded that athletes with higher levels of intrinsic motivation perceived that their coaches provided high frequencies of positive and information-based feedback and low frequencies of punishment-oriented and ignoring behaviours. It is interesting, however, that there was no significant difference between boys with sport experience and boys with limited sport experience regarding the effect of leisure-time sport participation on perceived teacher's feedback. It seems that boys don't seek their teacher's encouragement and approval as much as girls.

Results of the study indicated that both girls' and boys' perceived learning environment in physical education differs depending on whether they participate in sport in their leisure time. Particularly, students with leisure-time sport experience reported significantly higher ratings on perceived threat to sense of self than students without sport experience, which means that they felt physical education to be more non-threatening to their self esteem. Previous research has confirmed that student perceptions of non-threatening and challenging environments are powerful constructs as they are the strongest predictors of high levels of intrinsic motivation (Mitchell, 1996; Mitchell & Chandler, 1996). It is probable that students with sport experience have a higher physical ability and tasks in physical education classes are more appropriate for them than for students with limited sport experience. Therefore, it is understandable that students with limited sport experience might perceive physical education as more threatening to their self esteem, as suggested by Fox (1992).

In conclusion, the results of this study are largely consistent with previous research (Anderssen, 1993; Goudas et al., 2001). It allows one to suggest more convincingly that physical education teachers should consider that students' motivation and perceived learning environment differs depending on the students' level of sport participation in their leisure time. Creating a non-threatening learning environment in physical education is particularly relevant to students with limited leisure-time sport experience. Moreover, teachers who are working with girls without leisure-time sport experience should provide positive general feedback in order to enhance girls' intrinsic motivation to participate in physical education.

6.5. Stability and causal nature of perceived positive general feedback and perceived threat to sense of self in physical education over a two-year period (Paper IV)

The results of this study revealed the existence of unidirectional cross-lagged effect between perceived threat to sense of self and perceived teacher positive general feedback in physical education partially supported the stated hypothesis. Specifically, low perceived threat to students' sense of self in physical educa-

tion resulted in students' higher perceptions of positive general teacher feedback. Results showed that perceived threat to sense of self exhibited a higher degree of stability than perceived positive general feedback in physical education over a two-year period, partially confirming stated hypotheses (Paper IV).

In a similar area, Kowalski et al. (2003) and Marsh and Yeung (1998) provided evidence that both more situation-specific self-concept components like physical self-worth and general self-esteem are relatively stable over a one-year period. However, physical self-worth and subdomain levels of physical self-concept indicated higher stability than general self-esteem. In the present study, students' perception of threat to their sense of self in physical education was found to exhibit a high degree of stability. Low mean scores of perceived threat to sense of self at both time points also indicate that students feel good about themselves in physical education and don't feel much threat to their self-esteem (see Table 6). Students' perceptions of their teachers' positive general feedback was less stable than the perceived threat to sense of self over a two-year period. An explanation for this finding might be that the nature of feedback given by teachers at higher grades was different. One possibility is that at higher grades the nature of feedback provided by the teacher is more informative/instructive rather than general.

The cross-lagged effects that determine the causal relationship among the perceived positive general feedback and perceived threat to sense of self seem to reveal that the way students feel about themselves in physical education predicts their perception of positive teacher feedback (see Figure 3). In other words, the lower the perception of threat to sense of self the higher the perception of positive general feedback. The lack of cross-lagged effect from perceived positive general feedback to perceived threat to sense of self is a point of interest. Vallerand's (1997) motivational sequence model suggests that coach/teacher feedback is one of the social factors affecting children's motivation, a relationship mediated by psychological mediators such as perceived competence, autonomy, and relatedness. Therefore, it would have been anticipated that perceived positive teacher feedback may also have an effect on students' perceived threat to sense of self in physical education. Also, recent studies in the perceived feedback research in sport domain have suggested that positive feedback is one of the social factors that has an effect on different psychological constructs like intrinsic motivation and perceived competence (Allen and Howe, 1998; Amorose and Horn, 2000; Amorose and Weiss, 1998; Black and Weiss, 1992).

The strong relationship between perceived positive feedback and different psychological outcomes in sport domain (e.g., intrinsic motivation, perceived competence) has been suggested by several researchers (Allen and Howe, 1998; Amorose and Horn, 2000). In the present study, perceived positive feedback was found to have strong negative correlation with younger students' perceptions of threat to sense of self in physical education, but did not have as strong relationship in later grades two years later. This finding indicates that the

relationship between teachers' positive general feedback and students' perception of threat in physical education is not stationary over time. The longitudinal model in our study seems to demonstrate that relationships between those two constructs changed over time. It seems to indicate that younger students' perception of the positive general feedback from the teacher may reduce feelings of threat to sense of self in physical education. This is consistent with Graham (1992) and Mawer (1995) notion that the use of expressions by the physical education teachers such as "good job", "great", "terrific", and "all right", which all can be characterized as general positive feedback, is helpful for developing a positive, motivating, and non-threatening learning environment, especially with young students who desire teacher's approval. On the contrary, as students grow older they obviously don't care about teacher's general approval as much as younger students. Schunk (1995) has also emphasized that simply telling to advanced students "good work" is not apt to have much effect unless students understand which aspects of performance are good.

In conclusion, the perceived threat to sense of self was more stable than the perceived teacher general feedback in physical education over a two-year period. The results also suggest that low levels of perceived threat to sense of self determines high levels of perception of positive general teacher feedback. When students feel good about themselves in physical education then they also perceive that their teacher responds more positively to their performances. On the contrary, when students do not feel good about themselves in physical education, we might expect that they perceive their teacher to be more negative in their responses to students' performances. This may lead to the lower self-esteem and amotivation towards physical education. A simple positive and enthusiastic statement may be a valuable tool in enhancing students' good feelings in physical education.

6.6. Limitations of the study

Although the results of the study have provided interesting information that point to the importance of different types of perceived feedback in affecting intrinsic motivation in physical education, as well support for the stability of the perceived positive teacher feedback and perceived threat to sense of self and the causal relationship between these two constructs over time, certain limitations should be noted. First, concerns can be raised regarding the instruments used to assess students' perceptions of both verbal and nonverbal teacher feedback (Paper III). One of the subscales from the revised PTF, perceived positive nonverbal feedback, showed a level of internal consistency that was below that recommended by Nunnally (1978). Although this subscale was not excluded from the study, it was suggested that caution should be used when interpreting results pertaining to this subscale.

Second, it has to be stressed that the structural model that examined the effect of both verbal and nonverbal types of perceived feedback on intrinsic motivation (Paper III) does not include important mediation variables like perceived competence and perceived autonomy that has been postulated in the cognitive evaluation theory (Deci & Ryan, 1985), as well as in Vallerand's (1997) motivational sequence. Both, Deci and Ryan's (1985) cognitive evaluation theory and Vallerand's (1997) motivational sequence posits that the effect of feedback from supervisor on subordinates' intrinsic motivation is mediated by the universal psychological needs of perceived competence, autonomy, and relatedness. Although autonomous support from the teacher has shown to be an important predictor of students' intrinsic motivation (Hagger et al., 2003), the perceived autonomy was relatively weak predictor (Ferrer-Caja & Weiss, 2000; Standage et al., 2003) or even non-significant predictor of intrinsic motivation among adolescents in physical education (Ntoumanis, 2001). Ntoumanis (2001) argued that in the compulsory physical education setting the teachers have to follow a very prescriptive curriculum which does not provide chances for student initiative role and thus may explain the absence of a link between perceived autonomy and intrinsic motivation. Nevertheless, the inclusion of students' perceptions of competence would have strengthened the structural model in this study (Paper III).

7. CONCLUSIONS

1. Psychometric parameters of the developed PTF questionnaire indicated that it was acceptable for use in measuring both perceived verbal and nonverbal teacher feedback among Estonian students in physical education.
2. Perceived positive general feedback and perceived teacher feedback about knowledge of performance were related to students' intrinsic motivation in physical education.
3. Perceived challenge and perceived threat to sense of self as dimensions of perceived learning environment were important predictors of students' intrinsic motivation in physical education.
4. Both male and female students with experience of participation in sport in their leisure time had higher levels of intrinsic motivation and lower levels of threat to sense of self in physical education than students who did not have experience of participation in leisure-time sport. Female students with leisure-time sport experience had higher levels of perceived general positive feedback than their counterparts without leisure-time sport experience.
5. Perceived positive general feedback exhibited lower levels of stability in physical education over a two-year period than perceived threat to sense of self. In terms of causal relationship, low levels of perceived threat to sense of self was a significant determinant of high levels of perceived positive teacher feedback over time.
6. The construct validity of the Physical Education Learning Environment Scale was supported.

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SUMMARY IN ESTONIAN

Õpetaja tagasiside tajumise ja õpikeskkonna tajumise osast õpilaste sisemisele motivatsioonile kooli kehalises kasvatuses

Üheks enamkasutatud teooriaks motivatsiooni käsitlevates uuringutes spordi ja kehalise kasvatuses valdkondades on olnud enesemääratlemise teooria (Deci ja Ryan, 1985; Ryan ja Deci, 2000). Enesemääratlemise teooria ühe alateooria, kognitiivse hindamise teooria, kohaselt hindab indiviid enne konkreetset tegevuses osalemist enda kompetentsuse taset selles. Samuti hindab indiviid, millisel määral on antud tegevuses osalemine tema enda poolt kontrollitav. Kui indiviid tajub end kompetentsena ning autonoomsena antud tegevuses, siis on ta enam sisemiselt motiveeritud selles tegevuses osalema.

Uuringud spordi valdkonnas on näidanud treeneri tagasiside tajumise mõju sportlaste kompetentsuse tajumisele ning sisemisele motivatsioonile. Treeneri positiivse ja informatiivse tagasiside tajumine sportlastel on seotud nende kompetentsuse tajumise ning sisemise motivatsiooniga treeningutes osalemisel (Allen ja Howe, 1998; Amorose ja Horn, 2000, 2001; Black ja Weiss, 1992; Hollebeak ja Amorose, 2005). Õpetaja tagasiside tajumise mõju õpilaste kompetentsuse tajumisele ning sisemisele motivatsioonile kooli kehalises kasvatuses pole aga piisaval määral uuritud, kuna senini puudus vastav küsimustik kehalise kasvatuses õpetaja tagasiside tajumise hindamiseks õpilaste poolt.

Käesoleva töö peamiseks eesmärgiks oli välja töötada küsimustik, et hinnata kehalise kasvatuses õpetaja verbaalse ja mitteverbaalse tagasiside tajumist õpilaste poolt ning selgitada, mil määral mõjutavad õpetaja tagasiside liikide tajumine õpilaste sisemist motivatsiooni kooli kehalises kasvatuses. Töös selgitatakse õpikeskkonna erinevate dimensioonide (enesetundele ohu-, väljakutse-, võistluslikkuse tajumine) mõju sisemisele motivatsioonile kehalises kasvatuses. Lisaks hinnatakse spordiga tegelemise ja mittetegelemise mõju õpilaste sisemisele motivatsioonile, õpetaja tagasiside liikide ja õpikeskkonna dimensioonide tajumisele kehalises kasvatuses. Uuringus käsitletakse üldise positiivse tagasiside tajumise ning enesetundele ohu tajumise stabiilsust kehalises kasvatuses ning põhjuslikku seost nende vahel kaheaastase perioodi vältel.

Käesolev töö koosneb neljast uuringust. Esimeses uuringus töötati välja õpetaja tagasiside tajumise küsimustik (Perceptions of the Teacher's Feedback; PTF) ja määrati kindlaks õpetaja tagasiside liikide ning õpikeskkonna dimensioonide tajumise mõju sisemisele motivatsioonile. Uuringus osales 783 õpilast Tartu linna viie kooli 6. ja 8. klassist. Õpikeskkonna dimensioonide tajumise hindamiseks kasutati PELES (Mitchell, 1996) küsimustikku ning sisemise motivatsiooni hindamiseks IMI (McAuley jt., 1989) küsimustikku. Samad vaatlusalused osalesid ka teises uuringus, milles hinnati spordiga tegelemise ja mittetegelemise mõju eelpool nimetatud psühholoogilistele konstruktsioonidele kehalises kasvatuses.

Kolmandas uuringus täiendati PTF küsimustikku, lisades sellesse alaskaalad õpetaja mitteverbaalse tagasiside tajumise hindamiseks. Uuringus osales 638 õpilast samast viiest Tartu linna koolist. Tagasiside liikide tajumise mõju uurimisel sisemisele motivatsioonile kasutati modifitseeritud SMS (Hein jt., 2004) küsimustikku.

Neljandas, kaheaastase intervalliga longitudinaalses uuringus osales 302 õpilast esimesest uuringust. Õpilaste identifitseerimiseks kasutati nende sünnikuupäevi. Uuriti üldise positiivse tagasiside tajumise ja enesetundele ohu tajumise stabiilsust ning põhjuslikku seost nende vahel kehalises kasvatuses kaheaastasel perioodil.

Antud töös selgus, et esimeses uuringus väljatöötatud ja kolmandas uuringus täiendatud PTF küsimustikku võib lugeda usaldusväärseks ja valiidses, et hinnata kehalise kasvatuses õpetaja verbaalse kui ka mitteverbaalse tagasiside tajumist Eesti kooliõpilastel. Õpetaja üldise positiivse tagasiside tajumine ning informatiivse tagasiside tajumine avaldas olulist positiivset mõju õpilaste kompetentsuse tajumisele ning sisemisele motivatsioonile kehalises kasvatuses.

Õpikeskkonna dimensioonide tajumisest avaldas kõige enam mõju õpilaste sisemisele motivatsioonile kehalises kasvatuses väljakutse tajumine ja enesetundele ohu tajumine. Õpilased on sisemiselt motiveeritumad ja tunnevad end kompetentsena kui nad tajuvad õpikeskkonda nende enesetunnet vähem ohustavana ja samas nende võimetele või oskustele optimaalset väljakutset avaldavana.

Töö tulemused näitasid, et sporditreeningutel osalevad õpilased on enam sisemiselt motiveeritud ning tajuvad madalamat ohtu enesetundele kehalises kasvatuses võrreldes õpilastega, kes ei osale sporditreeningutel väljaspool kooli. Spordiga tegelevad tütarlapsed tajusid oluliselt enam kehalise kasvatuses õpetaja üldise positiivse tagasiside andmist võrreldes tütarlastega, kellel on vähesed spordikogemused.

Longitudinaalne uuring näitas, et enesetundele ohu tajumine on õpilastel kehalises kasvatuses stabiilne. Tulemustest selgus, et enesetundele ohu tajumine on kaheaastasel perioodil õpilastel stabiilselt madal. Ka õpetaja üldise positiivse tagasiside tajumine näitas suhtelist stabiilsust kaheaastase perioodi vältel, ent stabiilsuskoefitsient oli märgatavalt madalam võrreldes enesetundele ohu tajumisega. Uuring näitas, et enesetundele madalama ohu tajumise korral õpilased tajuvad rohkem õpetaja üldise positiivse tagasiside andmist.

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