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# Perceptions of teacher's feedback and learning environment as predictors of intrinsic motivation in physical education

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**Abstract**

*Objectives*: To investigate whether the perceptions of different domains of the learning environment in physical education, such as perceived teacher feedback, perceived challenge, perceived competitiveness and perceived threat to sense of self, are related to intrinsic motivation.

*Method*: School children ($N = 783$; $n = 375$ boys, $n = 408$ girls) aged 12–15 yrs completed three questionnaires. The physical education learning environment scale (PELES) was used to investigate the perceived threat to sense of self, perceived challenge and perceived competitiveness. The perceptions of the teacher's feedback (PTF) questionnaire was developed for this study. The construct validity of factor structure of the instrument was confirmed by confirmatory factor analysis (CFA). Students' intrinsic motivation was assessed by the intrinsic motivation inventory (IMI).

*Results*: For middle school students, the most important predictors of intrinsic motivation were the perceived threat to sense of self, perceived challenge and perceived positive general feedback. Exploratory factor analyses (EFA) and CFA provided evidence of the adequate construct validity for the PTF and confirmed the construct validity for the PELES.

*Conclusion*: Teachers need to create a learning environment that leads students to perceive it as non-threatening and challenging. They should seek to provide positive general feedback to create a more stimulating learning environment.


*Keywords:* Perceived learning environment; Perceived teacher's feedback; Intrinsic motivation

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## Introduction

The most important function in contemporary physical education is to prepare children for a lifetime physical activity (Sallis & McKenzie, 1991). It is assumed that when people are intrinsically motivated to exercise, they will more likely be physically active for long periods in their life. Therefore, motivating students, specifically in respect of enhancing their intrinsic motivation, is an important problem for physical education teachers.

According to Deci and Ryan's (1985) cognitive evaluation theory, individuals' level of intrinsic motivation toward a particular achievement activity will vary as a function of the degree to which they perceive themselves to be competent at that activity and believe themselves to be self-determining in regard to their performance and behaviour in that activity. Self-determination theory (Deci & Ryan, 1985, 1991) makes a relatively clear statement concerning the relationship between perception of competence and motivation. Situations that provide failure feedback are more likely to generate feeling of incompetence and undermine one's intrinsic motivation for the given activity.

Considerable research supports the notion that teachers are able to enhance students' level of motivation by evaluating them on effort and improvement rather than ability, emphasising individualised learning, and providing task related feedback that assists them in their efforts to improve (Ames, 1992; Brophy, 1987). Fitts and Posner (1967) attributed three functions to the notion of feedback—providing knowledge, motivation and reinforcement. Because feedback operates as a strong source of motivation it can be a vital factor in learning. Several authors (Cloes, Premuzak, & Piéron, 1993; Graham, 1992; Hellison & Templin, 1991; Sharp, 1992) have also emphasised the significance of teachers' feedback in the teaching–learning process.

Moreover, because of theoretical and empirical evidence that highlights the importance of perceived competence in achievement settings, it is necessary to understand how students judge their competence. That is, what sources or criteria do individuals use to evaluate their level of competence? Individuals often judge their competence by comparing their performance against standards of performance they set for themselves. In addition, the way in which adults respond to children's performance may serve as a salient source of information to evaluate ability. Schunk (1995) has presented a model of achievement behaviour highlighting the role of self-efficacy in which attention is given to different types of feedback such as attributional feedback (ability and effort or ability plus effort feedback), performance feedback, and goal progress feedback.

Many researchers (Allen & Howe, 1998; Amorose & Weiss, 1998; Amorose & Horn, 2000) have consistently demonstrated that parent and coach feedback are important sources of competence information for subordinates. Ryan, Connell, and Deci (1985) have suggested that the type of feedback teachers give students can also have a significant impact on students' level of intrinsic motivation. Specifically, they argued that positive information-based feedback given in response to student performances resulted in increased perceptions of competence and a corresponding increase in intrinsic motivation.

Similarly Horn (1987, 1992) has also suggested that informational feedback given in response to students' performance errors should result in an increase in students' perceptions that they themselves can control future performance outcomes which should then increase students' level of intrinsic motivation.

Amorose and Horn (2000), studying the relationships between the athletes' perception of differ-

ent types of feedback and the level of intrinsic motivation, used the coaching feedback questionnaire (CFQ). The CFQ was developed as a questionnaire version of the coaching behaviour assessment system (CBAS; Smith, Smoll, & Hunt, 1977). The CFQ includes 16 items representing eight different types of feedback responses. To determine the structure underlying athletes' perception of their coaches' feedback, the principal axis factor analysis was used. Three factors emerged, labelled as positive-informational feedback, punishment-oriented feedback and non-reinforcement-ignoring mistakes. Although, the coefficients of internal consistency were acceptable, the structure of the CFQ was not subjected to confirmatory factor analysis (CFA). Intrinsic motivation was assessed using the intrinsic motivation inventory (IMI; McAuley, Duncan, & Tammen, 1989). The results showed 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.

Allen and Howe (1998) studied the perception of coach feedback among field hockey players aged 14–18 yrs. The CFQ, with two additional scales assessing non-verbal communication, was used. Examination of the resulting factors revealed that the items representing coach feedback could be separated into seven interpretable factors. However, three factors were unreliable and were excluded from analyses. The remaining factors were labelled encouragement/information, praise/information, non-verbal criticism, and information only. These feedback variables resulted in a significant relationship with perceived competence. Specifically, more frequent praise/information following a good performance and less frequent encouragement and corrective information in response to a mistake or poor performance were related to high perceptions of physical competence. In these two studies, the items were developed on the basis of the CFQ, yet the factors that emerged were labelled differently.

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, no study to our knowledge has attempted to examine how the perception of feedback provided by physical education teachers is related to intrinsic motivation and to the components of learning environment.

Several investigators (Goudas & Biddle, 1994; Goudas, Dermitzaki, & Bagiatis, 2001; Newton & Duda, 1999) have used the IMI(Ryan, 1982) reworded for use in sport settings by McAuley et al. (1989) to study the relationships between the perception of different dimensions of motivational climate in physical activity settings and dimensions of intrinsic motivation.

Papaioannou (1994) was one of the first to examine the motivational climate of physical education classes. Drawing on the work of Ames and Archer (1988) on classroom motivational climate, Papaioannou developed the learning and performance orientations in physical education classes questionnaire (LAPOPECQ). 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. The first two subscales comprised a mastery factor while the other three a performance factor. To study how the observed five subscales are related to intrinsic motivation, an adapted version of two subscales (challenge and interest) from Harter's (1981) intrinsic versus extrinsic motivational orientation in the classroom questionnaire was used. The results indicated that intrinsic motivation was positively related to the learning-oriented scales and unrelated to performance-oriented scales.

Goudas and Biddle (1994) studied the perceived motivational climate of students aged 13–15

yrs using the LAPOPECQ, but with two additional subsales comprising items about the perceptions of teacher support and students' perception of choice. The new scale was called the physical education class climate scale (PECCS). To provide support for the predictive validity of PECCS, the authors examined the multivariate relationships of the mastery and performance factors with intrinsic motivation in the context of physical education lessons. 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.

Recently, several researchers (Berlant and Weiss, 1997; Solmon, 1996; Theebom, De Knop & Weiss, 1995) investigated students' goal orientation and motivation in studies involving actual manipulation of teaching/learning environments and measures of instructional variables. In Berlant and Weiss's (1997) study, students' attention to tennis stroke demonstration was found not to be related to either task or ego orientations. The authors raised questions about the impact of students' achievement goal orientations on their actual learning behaviour. They particularly questioned the appropriateness of exclusively using the achievement goal theory to interpret motivated learning behaviour. Theebom et al. (1995) examined the differentiated effects of learning climates on intrinsic motivation but found no differences. Students in both conditions demonstrated an equal improvement in all motivation dimensions (challenge, mastery, and curiosity motivations). It seems, therefore, that students' motivation to learn can be improved in both instructional motivation climates.

An another approach to study the perception of class climate in physical education setting without emphasising children's perception of different goal orientations was used by Mitchell (1996). Based on the research of Deci, Betley, Kahle, Abrams and Porac (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. Dimensions of perceived challenge, perceived threat to sense of self, perceived competitiveness, and perceived control were assessed. The scale was administered with the IMI. Results indicated that perceived threat and perceived challenge were the most important predictors of intrinsic motivation. However, Ntoumanis and Biddle (1999) have noted that the further psychometric analysis of PELES is needed, especially to confirm its factor structure.

Although several questionnaires have been developed for studying dimensions of the physical education learning environment or climate, a number of unanswered questions remain. The research conducted so far has not dealt with the students' perception of feedback provided by the teacher and its impact on intrinsic motivation.

Therefore, this study sought to identify which types of teacher feedback perceived by middle school students may have an influence on intrinsic motivation. It was hypothesised that school children's perception of different types of feedback provided, may differentially impact on intrinsic motivation.

The main purpose of this study was to investigate whether the perceptions of different domains of the learning environment in a physical education setting, such as the perceived teacher feedback, perceived challenge, perceived competitiveness and perceived threat to sense of self, are related to intrinsic motivation. Furthermore, an attempt was made to develop a questionnaire to measure the perception of teacher's feedback in physical education and to retest the validity of the factor structure of the PELES.

## Method

### *Participants and procedures*

The participants were 783 (375 boys and 408 girls) school children aged 12–15 yrs from a town of 100,000 inhabitants in Estonia. Questionnaires were administered in classrooms in five schools located in the same part of town. Parental consent was obtained for all children. Permission to carry out the study was obtained from the headteacher or from other teachers. It was emphasised to the participants that the questionnaire was designed to measure students' general feelings about physical education classes and not about one particular class. The questionnaire took approximately 10–12 min to complete. The children's class teacher and one researcher were present to help children having difficulty understanding the questions. Children were assured that their answers would remain confidential. The completed questionnaires were collected by the researcher.

### *Instrumentation*

#### *Perceived learning environment*

The PELES (Mitchell, 1996) was used to measure the perceived learning environment using a five-point Likert scale (5=strongly agree to 1=strongly disagree). The PELES was developed to measure student perceptions of the learning environment in physical education on dimensions of perceived threat to sense of self, perceived challenge, perceived competitiveness and perceived control, with 24 items. Referring to the work of Mitchell (1996), the perceived control subscale was removed from the current study because of its construct invalidity. 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.

#### *Perceived teacher's feedback*

A new instrument to measure perceptions of the teacher's feedback (PTF) was developed. The items were generated by the authors of this study based on previously used feedback categories in the sport domain (Allen & Howe, 1998; Amorose & Weiss, 1998; Amorose & Horn, 2000) and the results of a pilot study. In the pilot, using the self-assessment feedback instrument (Mancini & Wuest, 1989), the frequency and the types of feedback provided by two teachers (female and male) during 22 physical education classes were recorded. Analyses of the more frequently used feedback types allowed six categories to be formed: praise, instruction, instruction during performance, encouragement, criticism, confirmation/reinforcement. Based on this, 12 items were designed to measure the perception of teacher's feedback.

All negatively stated items in both questionnaires (PELES and PTF) 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*

In order to measure intrinsic motivation, school children responded to the Estonian version of the IMI (McAuley et al., 1989). The IMI was administered with the PELES and PTF. An original version of the IMI was used by Ryan, Mims and Koestner (1983) and Plant and Ryan (1985). McAuley et al.'s (1989) sport oriented version of the IMI contains 16 items assessing four components of intrinsic motivation: interest-enjoyment, perceived competence, effort-importance, and tension-pressure. The items of the IMI were adapted to measure the intrinsic motivation of school children in physical activity settings 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 7 (strongly agree) to 1 (strongly disagree).

*Data analysis*

The total sample of 783 participants was randomly split to produce two subsamples, one for an exploratory factor analyses (EFA) ($n = 391$), and the other for a CFA ($n = 392$). The SEPATH program of the Statistica package was used.

*EFA*

A principal component analysis was conducted to establish construct validity for both PELES and PTF. The number of factors that constitute a solution for PELES and PTF were based on several criteria. Consideration included the number of eigenvalues that exceed 1.0, the percentage of variance accounted for by the number of factors, inspection of the scree plot to determine when the eigenvalues begin to level off and the cohesiveness of the items within factors identified. After the number of factors had been established, a varimax and direct oblimin (oblique) rotation was used to simplify interpretation of the factors. Factor loadings $>0.40$ were considered to be significant for including the items in a factor or subscale (Stevens, 1986).

*CFA*

To clarify the model and to examine whether the factor structure that emerged from the EFA could be replicated by the second half of the total sample, the maximum likelihood factor analysis was used for both PELES and PTF. Loadings were rotated (varimax and oblique) to simple structure, with each item loading at greater than 0.40 on only one factor. The goodness of fit test parameters were registered.

*Reliability*

The internal consistency of each emerged subscale of the instruments (PELES, PTF and IMI) were calculated using Cronbach's $\alpha$ statistic.

*Correlational analyses*

Pearson product correlation coefficients were used to investigate relationships between the dimensions of the IMI, PELES and PTF.

*Regression analyses*

Multiple regression analyses was used to investigate relationships between variables and whether the perceived learning environment might predict intrinsic motivation. In the regression

analyses, the three subscales of the IMI (enjoyment, effort and competence) and the total IMI score were the dependent variables and dimensions of the PELES and PTF were the independent variables.

## Results

### *Validity and reliability of the instruments*

*PELES*

A principal components analysis (followed by both varimax and oblique rotation) was conducted. The results from the varimax and oblique rotation were similar. Factor analysis with varimax rotation resulted in a three-factor solution accounting for 58.1% of the variance. Items with small communality values were eliminated from the study prior to a principal components analysis. Each item then loaded on only one factor and indicated that items designed to measure perceived challenge, threat to sense of self, and competitiveness loaded, for the most part on different factors. A minimal loading of 0.40 was used in the interpretation of these factors. Loadings are reported in Table 1.

Besides the EFA the factor structure of the PELES was also examined by a CFA. Maximum likelihood method of estimation was used, and it indicated that each item loaded on the same factor that emerged in a EFA. As shown on Table 1, one item loaded on an unexpected factor. Item TH2 ('Physical education makes me feel good about myself') loaded on the same factor as a four items designed to measure perceived challenge. The explanation lies in the fact that when students perceive the environment challenging and can perform the exercises, they enjoy it and feel good about themselves. Since all of the items had factor loadings greater than 0.40, they

Table 1
Factor loadings for the three-factor model of the PELES

| Dimension | Items | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|---|
| Challenge | CH4 | 0.824 | | |
| | CH2 | 0.776 | | |
| | CH5 | 0.689 | | |
| | CH1 | 0.676 | | |
| | TH2 | 0.520 | | |
| Threat to sense of self | TH1 | | 0.780 | |
| | TH3 | | 0.776 | |
| | TH4 | | 0.750 | |
| Competitiveness | CO1 | | | 0.775 |
| | CO2 | | | 0.747 |
| | CO4 | | | 0.615 |
| Eigenvalue | | 3.1 | 2.1 | 1.3 |
| Variance accounted (%) | | 27.9 | 18.8 | 11.4 |
| Cumulative % variance | | 27.9 | 46.7 | 58.1 |

*Note*: Full scale available from the second author.

summed to form a measure of perceived challenge (Items CH1, CH2, CH4, CH5, TH2), perceived threat to sense of self (Items TH1, TH3, TH4), and perceived competitiveness (Items CO1, CO2, CO4). Cronbach α reliability coefficients for these subscales of the PELES were 0.76, 0.67, and 0.57, respectively. The perceived competitiveness subscale, with an α of 0.57, was considered unreliable and was excluded from further analysis.

The four indices considered to test the goodness of fit of the model and the data were following: the $\chi^2(41,n = 392) = 146.17$, $p < 0.001$, the $\chi^2/\text{df ratio} = 3.56$, GFI = 0.95, RMSR = 0.078, Steiger Lind RMSEA = 0.088 (with lower 90% confidence bound 0.074 and with upper 0.103). A universally accepted value for $\chi^2/\text{df}$ ratio has not been established. However, a ratio of three or less (Jöreskog, 1969) and values range from less than 2 to less than 5 (Byrne, 1989) have been proposed. Values for the GFI range from 0 to 1, with values closer to one indicating a better model fit. The RMSR under 0.05 is considered to be excellent, but a value between 0.05 and 0.10 is typically considered acceptable (Rupp & Segal, 1989). The goodness of fit parameters, therefore, provided some confirmation of the factorial structure of the PELES.

*PTF*

A principal components analysis with varimax rotation (oblique rotation was similar) resulted in the identification of three conceptually distinct factors. Again, due to small communality value two items were eliminated from the study. These three factors accounted for 61.2% of the variance. A minimal loading of 0.40 was used as a criterion value in the interpretation of individual factors. Each item loaded on only one factor. The factor loadings are presented in Table 2.

CFA (maximum likelihood method) indicated exactly the same factor structure that emerged in the exploratory analysis. The goodness of fit test parameters were: $\chi^2(24,n = 392) = 62.16$, $p < 0.001$, the $\chi^2/\text{df ratio} = 2.59$, GFI = 0.98, RMSR = 0.061, Steiger Lind RMSEA = 0.067 (with lower 90% confidence bound 0.048 and with upper 0.087). Examination of the factor load-

Table 2
Factor loadings for the three-factor model of the PTF

| Dimension | Items | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|---|
| Positive specific feedback | FB7 | 0.782 | | |
| | FB5 | 0.773 | | |
| | FB6 | 0.733 | | |
| | FB9 | 0.693 | | |
| | FB1 | 0.575 | | |
| Positive general feedback | FB4 | | 0.841 | |
| | FB2 | | 0.840 | |
| | FB12 | | 0.601 | |
| Knowledge of performance | FB11 | | | 0.861 |
| | FB8 | | | 0.826 |
| Eigenvalue | | 2.6 | 2.5 | 1.1 |
| Variance accounted (%) | | 25.8 | 24.6 | 10.8 |
| Cumulative % variance | | 25.8 | 50.4 | 61.2 |

*Note*: Full scale available from the second author.

ings (Table 2) indicated that items on Factor 1 described the teacher's feedback, which can be characterised as positive and information-based feedback given as responses to students following performance. Given these characteristics of the feedback and loadings, Factor 1 was labelled perceived positive specific feedback. Items loading on Factor 2 described the teacher's feedback, which can be characterised as encouraging, praising and confirming based feedback given in responses to the performance success of students. Hence, Factor 2 was labelled perceived positive general feedback. Finally, examination of the items loading on Factor 3 described the teacher's feedback, which can be classified as information about students' performance and was thus labelled perceived knowledge of performance. The internal consistency of the PTF subscales were perceived positive specific feedback (0.74), perceived positive general feedback (0.71), and perceived knowledge of performance (0.70).

*IMI*

The internal reliability of the subscales was enjoyment-interest (0.88), effort-importance (0.79) and competence (0.78), with pressure-tension only 0.51. This was considered unreliable and was excluded from further analyses. The three subscales were summed to yield a composite measure of intrinsic motivation. To facilitate comparison between subscales, the total scores for each subscale were divided by the number of items to generate mean values.

*Correlational analyses*

To determine the relationships between the dimensions of intrinsic motivation, perceived learning environment and perceived teacher's feedback, Pearson product–moment correlation was used. Results of the correlation analyses and mean values and standard deviation of observed dimensions are presented in Table 3. Intrinsic motivation (total scores) as well as the IMI sub-components correlated positively with perceived challenge and perceived threat to sense of self. The perceived positive general feedback and perceived knowledge of performance were related to all observed

Table 3
Descriptive statistics and correlations between intrinsic motivation and perceived learning environment ($n = 699$)

| Perceived dimensions | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. Perceived competence | 1.00 | | | | | | | |
| 2. Interest/enjoyment | 0.470* | 1.00 | | | | | | |
| 3. Effort/important | 0.314* | 0.617* | 1.00 | | | | | |
| 4. Perceived challenge | 0.203* | 0.539* | 0.661* | 1.00 | | | | |
| 5. Perceived threat | 0.588* | 0.338* | 0.172* | 0.037 | 1.00 | | | |
| 6. PPSF | −0.044 | −0.025 | 0.101* | 0.243* | −0.202* | 1.00 | | |
| 7. PPGF | 0.376* | 0.477* | 0.362* | 0.394* | 0.287* | −0.038 | 1.00 | |
| 8. PKP | 0.109* | 0.365* | 0.262* | 0.358* | 0.087 | 0.005 | 0.440* | 1.00 |
| 9. IMI (total scores) | 0.506* | 0.912* | 0.806* | 0.572* | 0.375* | −0.009 | 0.478* | 0.327* |
| Mean | 5.05 | 5.05 | 5.08 | 4.16 | 4.02 | 3.43 | 3.01 | 2.78 |
| Standard deviation | 1.04 | 1.48 | 1.16 | 0.91 | 0.60 | 0.70 | 0.79 | 0.89 |

*Note*: Dimensions of the PTF; PPSF: perceived positive specific feedback; PPGF:perceived positive general feedback; PKP: perceived knowledge of performance.*$p < 0.001$.

dimensions. The perceived positive specific feedback had positive significant relationships with dimensions of effort/important and perceived challenge, whereas with perceived threat the relationship was negative.

*Regression analyses*

In order to examine whether the dimensions of the learning environment (perceived challenge, perceived threat, perceived competitiveness) and different types of feedback provided by teacher (perceived positive general feedback, perceived positive specific feedback, perceived knowledge of performance) were related to students' reported intrinsic motivation, four separate hierarchical regression analyses were performed. Dependent variables were the subscales of enjoyment, effort and competence as well as the total IMI score. Results are presented in Table 4.

Perceived challenge was the most important predictor of the three dependent variables (enjoyment, effort, IMI), whereas the perceived threat to sense of self-revealed to be more essential for perceived competence. From the three perceived feedback variables, positive general feedback was a significant predictor for all observed dimensions of IMI, specially for perceived competence.

## Discussion

This study was designed to determine the extent to which students' perceptions of the learning environment, including perceptions of feedback, predicted intrinsic motivation and its components. Results revealed that the perceived learning environment comprising of perceived challenge, perceived threat to sense of self, and perceived general positive feedback, is a valid predictor of intrinsic motivation and also its components for school children 12–15 yrs of age.

Considering Ntoumanis and Biddle's (1999) concern that the validation process of the PELES was inadequate, both an EFA and CFA were conducted to retest the construct validity of the instrument. A three-factor solution emerged from the EFA and the CFA indicated that imposing

Table 4
Increments in $R^2$ values from multiple regression analyses for enjoyment, effort, competence and intrinsic motivation

| | Enjoyment $F_{(5,733)} = 119.5$ $p < 0.0001$ | Effort $F_{(3,726)} = 204.9$ $p < 0.0001$ | Competence $F_{(5,722)} = 102.3$ $p < 0.0001$ | IMI $F_{(4,701)} = 165.2$ $p < 0.0001$ |
|---|---|---|---|---|
| Perceived challenge | 0.290** | 0.428** | 0.011** | 0.326** |
| Perceived threat | 0.100** | 0.023** | 0.353** | 0.123** |
| Perceived positive general feedback | 0.041** | 0.005* | 0.043** | 0.031** |
| Perceived positive specific feedback | 0.009* | – | – | 0.005* |
| Perceived knowledge of performance | 0.004* | – | 0.004* | – |
| Total $R^2$ | 0.449 | 0.457 | 0.422 | 0.485 |

Significant $R^2$ change: $^{**}p < 0.001$, $^{*}p < 0.05$.

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. The α-coefficient for perceived challenge and perceived threat to sense of self subscales exceeded the minimal criteria of 0.60 for measure of internal consistency. The low reliability of the perceived competitiveness subscale (0.57) did not allow its inclusion in subsequent analysis. This is not consistent with Mitchell's research. The current study indicated that in respect of perceived competitiveness, students viewed the learning environment differently. Therefore, it may be wise to consider rewording some items 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, Deci, & Ryan, 1987).

The results of the regression analyses indicated 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 revealed to be a more important predictor for perceived competence than perceived challenge. However, parallels can be drawn between our results and those of Mitchell (1996) who has claimed that intrinsic motivation is likely to be high when students perceive the learning environment to be non-threatening to their self-esteem and physically challenging. These findings are also consistent with the intrinsic motivation literature (Deci & Ryan, 1985).

Weiss (1987) and Feltz (1988) have suggested that ensuring students adopt positive attitudes towards their abilities in physical education is one possible option for increasing students' intrinsic motivation. When teachers continually provide experiences enabling students to be successful, it is likely to increase their perceived ability. Mitchell (1996) has argued that for most students, repeated success should lead to a more positive feeling of self-worth and a lower perception of threat to one's sense of self. Bandura and Schunk (1981) have also contended that experiencing failure is conducive to lower levels of intrinsic motivation, while success promotes intrinsic motivation.

To investigate whether the perceived teacher behaviour in respect of providing feedback is related to intrinsic motivation the PTF was developed. The construct validity of the PTF was supported by the results of both EFA and CFA. 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. The perceived positive general feedback was found to enhance the prediction of intrinsic motivation beyond that accounted for by perceived challenge and perceived threat to sense of self. Furthermore, the results of the regression analyses showed that a small but significant amount of variance (3–4%) in all components of the IMI was explained by perceived general feedback. Several researchers (Allen & Howe, 1998; Amorose & Horn, 2000; Black & Weiss, 1992) have also suggested that coaches who frequently provide positive and encouraging 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 can be paralleled with physical education classes and teachers' feedback. Amorose and Horn (2000), examining the relationship between the IMI subscales and the perceived coaches feedback among athletes aged 17–23 yrs, found that, athletes who are high in two subscales (interest-enjoyment and perceived competence) perceived their coaches to be high in frequency of positive and information-based performance feedback. The findings of the present study provide support for this. The small, but statistically significant amount of variance in perceived competence and in perceived interest-enjoyment is explained by perceived positive general feedback. One might suggest that teachers who provide more positive general feedback are more likely to be successful in facilitating children's intrinsic motivation because such teacher's behaviour enhances both children's perception of competence and interest to physical activity.

The positive correlation coefficient between the subscales of perceived knowledge feedback and interest-enjoyment suggests the possibility that the children are more involved in exercise if they feel they are provided with feedback concerning the knowledge of how to perform exercise.

The lack of relationship between perceived positive specific feedback and perceived competence, as well as with intrinsic motivation, is also a point of interest. It is possible that younger students just do not understand or perceive their teacher providing specific feedback. Magill and Wood (1986) suggest that if the feedback is too specific and precise, this might 'overload' the learner and interfere with the learning process. Accordingly, teachers should avoid using statements their pupils probably do not understand, particularly when pupils are in the early stage of learning process.

To summarise, the results of this study suggest that 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. Furthermore, teachers should increasingly provide positive general feedback to create more stimulating learning environment and ultimately increase students' intrinsic motivation. Students holding the before-mentioned perceptions of the environment are likely to exhibit higher levels of intrinsic motivation.

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