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The Effect of Perceived Teacher Feedback on Intrinsic Motivation in Physical Education

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Abstract

This study examined the effect of different types of perceived teacher feedback on students' intrinsic motivation in physical education in line with self-determination theory. The participants were 638 students aged 14-18 years. The Perceptions of Teacher's Feedback scale was modified and validated in this study to measure perceived verbal and nonverbal teacher feedback. The modified version of SMS was used to measure the three types of intrinsic motivation. Data were analyzed using confirmatory factor analysis and structural equation modeling. Results indicated that after perceived teacher feedback about knowledge of performance, perceived positive general feedback was the strongest predictor of students' intrinsic motivation in physical education. Nonverbal types of perceived teacher feedback did not contribute to motivational differences.

Key words: perceived teaching behaviors, intrinsic motivational orientation, adolescents, covariance structure analysis

The Effect of Perceived Teacher Feedback on Intrinsic Motivation in Physical Education

Most of the research on motivation in the sport and exercise psychology literature has attempted to identify the different factors that may cause individuals to become predominantly either intrinsically or extrinsically motivated toward physical activity. The current theoretical approaches used to investigate students' motivational processes include self-determination theory (Deci & Ryan, 1985, 1991; Frederick & Ryan, 1995; Ryan & Deci, 2000) and Vallerand's (1997) hierarchical model of intrinsic and extrinsic motivation. Incorporating key elements from the self-determination perspective in the hierarchical model of intrinsic and extrinsic motivation, Vallerand proposed the following motivational sequence: Social factors → Psychological Mediators → Types of motivation → Consequences. This means that social factors (e.g., coaches/teachers' feedback, success/failure, competition/cooperation) influence children's perceptions of competence, autonomy, and relatedness (i.e., the psychological mediators) which in turn determine their motivation. Types of motivation then lead to the host of consequences (e.g., persistence in physical activity etc.). Recent studies in sport and physical education (PE) setting have demonstrated that perceptions of coach/teacher's positive feedback are a strong predictor of perceived competence, interest-enjoyment and intrinsic motivation (e.g., Amorose & Horn, 2000; Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003; Koka & Hein, 2003; Standage, Duda, & Ntoumanis, 2003a, 2003b; Wilson & Rodgers, 2004). By studying the effect of different types of perceived teacher feedback including nonverbal feedback on intrinsic motivation, however, researchers can contribute to a deeper understanding of the psychological processes of students in PE classes.

Recently conducted studies in a PE setting have provided valuable insight into what factors influence students' motivation in PE (e.g., Mitchell, 1996; Xiang, McBride, & Bruene, 2003; Xiang, McBride, Guan, & Solmon, 2003). For example, study of Xiang et al.

(2003a) provided empirical evidence for the importance of parental beliefs in third and fourth grade children's motivation in an elementary physical education running program. Children whose parents had high perceptions of their competence in the running program and viewed it as important were more likely to put forth effort in running program and perform well. Xiang et al. (2003b) found that second and fourth grade students were more motivated to engage in activity in PE if they believed participation would be of use to them. More specifically, they reported that elementary school children's intention for future participation in PE was positively related to their subjective task values of PE. Mitchell (1996) who observed 6 - 8 grade students in PE settings indicated 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. Most of these studies involved elementary school students, however, and did not include the effect of perceptions of teacher feedback on students' intrinsic motivation.

Researchers have suggested that students' reports of their thoughts were more accurate predictors of student achievement than observer estimates of time on task (Peterson & Swing, 1982; Peterson, Swing, Stark, & Waas, 1984). Studying children's self-reported data about their supervisor's feedback can provide important information in addition to examining the effect of actual feedback on children's psychological outcomes. Hence, the relationships between perceived coach feedback and psychological outcomes have received much attention in the sport literature (e.g., Allen & Howe, 1998; Amorose & Horn, 2000). Despite findings related to perceived coach feedback, perceptions of teacher feedback have received limited attention in PE. In addition, it should be acknowledged that coaching and physical education teaching settings are completely different. Furthermore, athletes mostly participate in sport voluntarily and may be more motivated from the beginning. Therefore, it is crucial to

understand students' motivational factors influencing participation in compulsory subject such as PE classes.

Recently, Koka and Hein (2003) developed the Perceptions of Teacher's Feedback (PTF) questionnaire by revising previously used feedback categories in the sport domain (Allen & Howe, 1998; Amorose & Horn, 2000; Amorose & Weiss, 1998). Principal component analyses resulted in a three-factor solution, supported by confirmatory factor analyses. The factors were labeled as perceived positive specific feedback, perceived positive general feedback, and perceived knowledge of performance. The results of this study indicated that both perceived positive general feedback and perceived feedback about the knowledge of performance had significant positive relationships with intrinsic motivation that was assessed by Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989). Specifically, this research indicated that perceptions of the teacher positive general feedback was a valid predictor of intrinsic motivation and its components such as perceived competence and perceived interest-enjoyment in middle school PE. To convey a clear and consistent message to students, however, it is crucial for the teachers to use both verbal and nonverbal communication (Yukelson, 1998).

Although both perceived verbal and nonverbal coaching behaviors and different psychological outcomes have been investigated in coaching setting (e.g., Allen & Howe, 1998), relationships between perceptions of nonverbal teacher behavior and psychological responses such as intrinsic motivation in PE classes have not been established. Allen and Howe 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. Extending these results to the current study, it

might be expected that higher frequency of perceived positive nonverbal feedback such as smiling, patting on the shoulder, and clapping hands from a PE teacher should lead to greater satisfaction with the teacher, which ultimately might increase student intrinsic motivation. Hence, one might also expect that negative nonverbal feedback from a teacher such as angry face, rolling the eyes, shaking the head may have no effect or a detrimental effect on students' intrinsic motivation in PE.

The IMI (McAuley et al., 1989) has gained widespread use and acceptance as a measure of intrinsic motivation in the context of sport and exercise. Markland and Hardy (1997), however, have noted that its dimensions: interest-enjoyment, perceived competence, effort-importance, and tension-pressure do not reflect the tenets of cognitive evaluation theory of Deci and Ryan (1985) upon which the IMI was based. Within the conceptual framework of self-determination theory, Pelletier and his colleagues (1995) developed and validated the Sport Motivation Scale (SMS). The SMS has been widely used (e.g. Doganis, 2000; Martens & Webber, 2002; Petherick & Weigand, 2002; Yves & Vallerand, 1995) to investigate different types of motivation among athletes or adults participating in sport clubs. The SMS was designed to represent the self-determination continuum of Deci and Ryan (1985) and Ryan and Deci (2000), and consists of seven subscales: amotivation, external regulation, introjection, identification, intrinsic motivation to know, intrinsic motivation to accomplish, and intrinsic motivation to experience stimulation.

Only one study, however, has attempted to adapt the SMS to the PE setting to investigate different types of intrinsic motivational orientations of schoolchildren (Hein, Müür, & Koka, 2004). Hein and his colleagues modified the three subscales of the SMS to measure different types of intrinsic motivation among students in school PE. This study provided evidence of the existence of three different dimensions of intrinsic motivation among Estonian school children aged 14-18 in PE setting. These three types of intrinsic

motivation have been defined by Vallerand et al. (1992). First, intrinsic motivation to know can be defined as performing an activity for the pleasure that one experiences while learning, exploring, or trying something new. Second, 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.

Giving the recent advancement in the theoretical underpinnings of intrinsic motivation, the present study was designed to investigate whether intrinsic motivation may be affected by students' perceptions of teacher feedback. Positively stated verbal and nonverbal feedback has shown a positive effect on children's intrinsic motivation in the coaching setting. In this study, we investigated the effects of verbal and nonverbal teacher feedback on students' intrinsic motivation in PE. It was hypothesized that students' perceptions of both verbal and nonverbal praise and instruction/feedback provided by the teacher would have a positive effect on intrinsic motivation. Second, it was hypothesized that students' perceptions of the nonverbal criticism would have no effect or have a negative effect on intrinsic motivation.

Specifically, the purpose of this study was twofold: a) To further develop the PTF questionnaire by the addition of subscales to measure perceived nonverbal feedback; and b) To examine the influence of teacher's verbal and nonverbal perceived feedback on middle and high school student intrinsic motivation in PE settings.

Method

Participants and procedure

The participants were 638 (268 boys and 370 girls) school children aged 14-18 years (M = 16.1, SD = 1.1) from a town of 100,000 inhabitants in Estonia. Students were taking PE as a required course (two times a week, 45-min per lesson). The focus of the middle school PE

program in Estonia is to provide an opportunity for students to participate in a wide variety of physical activities and to promote the mastery of the basic skills introduced at the elementary level. The focus of the high school PE program is to give opportunities for students to become more competent and proficient in most of the popular sports in Estonia (e.g., ball games, athletics, and skiing). The aim of both the middle and high school physical education is build a framework for lifetime activities and healthy living, wellness and fitness.

Questionnaires were administered in classrooms in five schools located in the same part of town and were similar in terms of their amount of pupils. Parental consent was obtained for all children. Permission to carry out the study was also obtained from the headmaster or from a class teacher. It was emphasized to the participants that the questionnaire was designed to measure students' general feelings about PE classes and not about the one particular class. The questionnaire took approximately 15 min to complete. The researcher and the students' class teacher were present to help the students if they had difficulty understanding the questions. However, the students raised no questions while completing the questionnaires. Students were assured that their answers would remain confidential.

Instrumentation

Instrumentation consisted of a revised and expanded version of the PTF (Koka & Hein, 2003), and a modified version of the SMS (Hein et al., 2004).

Modified Perceptions of Teacher's Feedback scale (PTF)

The original version of the PTF contained 10 items to measure perceived teacher' feedback on three subscales: perceived positive specific feedback, perceived positive general feedback, and perceived knowledge of performance. In this study the perceived positive specific feedback subscale (5 items, e.g., "If the teacher gives me more instruction, I will acquire the exercise faster") was excluded because of the reflection of these items to students beliefs about teacher feedback provision rather than the perceptions of the actual specific

feedback that was given. 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 Coaching Behavior Assessment System (CBAS; Allen & Howe, 1998) and were modified for the PE 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 subscales. Therefore, this expanded version of the PTF contained 14 items (see Table 1). Response choices ranged from 5 (strongly agree) to 1 (strongly disagree).

Sport Motivation Scale (SMS)

The modified version of SMS for measuring intrinsic motivation in PE settings was used (Hein et al., 2004). Responses were made, following the 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 the initial confirmatory factor analysis (CFA), Hein et al. removed one item from each intrinsic motivation subscale. After these modifications the CFA supported the re-specified three-factor model of the modified SMS. The goodness of fit statistics indicated a fairly good fit of the model to the data and were as following: $\chi^2(24, N = 396) = 47.3$, NFI (.94), NNFI (.93), CFI (.95), GFI (.95), AGFI (.90),

RMSEA (.05). Students reported on a 7 point Likert type scale anchored by *strongly agree* = 7 and *strongly disagree* = 1.

Data Analysis

Firstly, multiple imputation was used to replace missing observations with a score from another case with a similar profile of scores across other variables. The outliers were determined by the range of ± 3 standard deviations of the observed variables away from the means of computed corresponded latent variables and were considered for case exclusion. Based on these analyses, the 13 most extreme cases were excluded from the total of original 638 cases, retaining a final sample size of 625.

To test the structural construct of the revised version of the PTF, the final sample of 625 was randomly split to produce two subsamples, one for an exploratory factor analysis (EFA) (n = 306), and other for a CFA (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 subscales of the PTF was tested with confirmatory factor analysis using LISREL 8.51. Structural equation modeling procedures were used to test the relationship between perceived teacher's feedback and intrinsic motivation. The internal consistency of all subscales was assessed by Cronbach's alpha.

All confirmatory factor analyses were conducted with maximum likelihood procedures, using a polychoric correlation matrix and its asymptotic covariance matrix as data input, provided by PRELIS 2.51. Goodness of fit 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). These indexes were selected following the recommendation of Hu and Bentler (1995) who suggested using multiple indexes representing absolute and incremental fit measures. The values for goodness of fit indexes greater than .90 are typically

taken to reflect an acceptable fit, whereas for RMSEA, values of .05 or less indicate a close fit.

Results

Revision of the Perceptions of Teacher's Feedback (PTF) questionnaire

The EFA was conducted to establish construct validity of the revised PTF. A maximum likelihood method of the EFA 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 factors. The results of the EFA are reported in Table 1. Examination of the factor loadings indicated that items loading highly on Factor 1 described the perceptions of positive general teaching 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 content 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 relates to Factor 2. After these modifications Factor 1 comprised 3 items labeled as 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 as perceived knowledge of performance.

Factor 3 represented perceptions of praise in response to a good performance that was mostly nonverbal and was thus labeled as 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 content 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 as perceived negative nonverbal feedback.

The internal consistency of study measures was calculated using Cronbach's alpha. These values are presented in Table 2. The majority of subscales demonstrated coefficients greater than .70, indicating an acceptable level of internal consistency (Nunnally, 1978). There was a subscale that fell below the .70 criterion, 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, Schultz, Smoll, & Ptacek, 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 a CFA was used. The CFA was conducted with the second subsample (n = 319) taken from the final total sample size. The indexes of the confirmatory factor model are presented in Table 3 (Model 1) and the structural model in Figure 1. Indexes of CFA revealed an acceptable fit. Goodness of fit indices exceeded the .90 criterion proposed by Bentler (1990). Also, RMSEA was equal to the criterion of .05 proposed for good fit by Hu and Bentler (1999).

Structural equation model

Structural modeling was used to test the hypothesis that perceptions of different types of teacher's feedback may have an unequal effect on intrinsic motivation in PE. Correlational analyses showed that the three types of intrinsic motivation were strongly correlated (coefficients ranging from .65 to .69, see Table 2), so they are all measuring intrinsic motivation. Therefore, 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. The goodness of fit of the initial and re-estimated structural equation models are reported in Table 3 (Model 2 and Model 3, respectively), and the re-estimated structural model is shown in Figure 2. The results of the initial structural equation model showed that students' intrinsic motivation in PE was significantly predicted by perceived positive general feedback (standardized coefficient = .35, with 95 percent confidence intervals (CI_{95}) = .25 to .46) and perceived knowledge of performance (standardized coefficient = .19, CI_{95} = .09 to .28), whereas the association with perceived positive nonverbal feedback (standardized coefficient = .02, CI_{95} = -.06 to .11) and perceived negative nonverbal feedback (standardized coefficient = -.07, CI_{95} = -.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 subscale of perceived positive nonverbal feedback and perceived negative nonverbal feedback were excluded from the model since there was a lack of a statistically significant relationship with intrinsic motivation. The results of the re-estimated model showed that the proportions of unexplained variance in the structural equation did not change, remaining the same at 26 percent (see Figure 2). The goodness of fit statistics improved, especially RMSEA (see Table 3, Model 3). The values of standardized coefficient of perceived positive general feedback (standardized coefficient = .37, CI_{95} = .27 to .47) and perceived knowledge of performance (standardized coefficient = .20, CI_{95} = .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 PE beyond the perceived knowledge of performance.

Discussion

The main aim of the present study was to examine factors influencing students' intrinsic motivation in PE lessons. More specifically, the study sought to assess the strength of different types of perceived teacher feedback in predicting students' intrinsic motivation in PE in line with self-determination theory (Deci & Ryan, 1985, 1991 Frederick & Ryan, 1995; Ryan & Deci, 2000).

A revision of the perceptions of teacher feedback (PTF) scale was carried out to investigate the relationships of both perceived verbal and nonverbal teacher's feedback with intrinsic motivation. To address this issue, two subscales of nonverbal teacher feedback (perceived negative nonverbal feedback and perceived positive nonverbal feedback) were added to the PTF. Results of the exploratory factor analysis indicated that one nonverbal praise item (Item 4, "In response to a good performance the teacher smiles") 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") 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 coach 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") were removed in order to clarify the content validity of the instrument, the CFA supported the produced four-factor model of the revised PTF. Delete explanation for the 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 to "count to ten" before giving feedback. Therefore, it may be wise to consider rewording this item in future studies with adolescents.

The following discussion situates the perceptions of teacher feedback as one of the social factors within the context of self-determination theory (Deci & Ryan, 1985, 1991; Ryan & Deci, 2000) and Vallerand's (1997) hierarchical model of intrinsic and extrinsic motivation. The results of the structural equation modeling showed that students' intrinsic motivation was significantly predicted by perceived positive general feedback and perceived knowledge of performance, whereas the association with perceived positive nonverbal feedback and perceived negative nonverbal feedback were not statistically significant. Furthermore, after the exclusion of perceived positive and negative nonverbal feedback from the model, the goodness of fit parameters of the model improved.

The structural model results indicate that social factors such as perceived positive general teacher feedback represent potent determinant of students' intrinsic motivation in PE, beyond the teacher feedback about the knowledge of performance. These results are, in general, consistent with previous research in this area examining adolescents students in PE (e.g., Koka & Hein, 2003) and athletes in sport setting (e.g., Amorose & Horn, 2000) and with the self-determination theory (Deci & Ryan, 1985, 1991; Ryan & Deci, 2000). According to self-determination theory, hierarchical model of intrinsic and extrinsic motivation proposed by Vallerand (1997) suggests that the effect of social factors is mediated by perceptions of competence, autonomy, and relatedness. In this case, perceived teacher feedback as a social factor is mediated by students' perceptions of competence. We did not assess the effect of perceived teacher's feedback on students' perceptions of competence in this study. However, previous researches in the PE domain (e.g., Koka & Hein, 2003) and sport domain (e.g., Allen & Howe, 1998; Black & Weiss, 1992) have indicated that teachers/coaches who frequently provide positive and encouraging feedback may facilitate

the development of a high level of perceived competence. Thus, social factors that are generally perceived as positive and supportive of one's perceptions of competence will have a positive effect on one's intrinsic motivation to continue an activity.

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. An explanation for the non-significant effect of perceived nonverbal feedback on intrinsic motivation in the present model may be that teachers obviously provide small amount of nonverbal praise and criticism about students' performance in PE classes. This is consistent with our second hypothesis that students' perceptions of the nonverbal criticism have no effect or have negative effect on intrinsic motivation in PE. Correlational analyses revealed, however, that perceived negative nonverbal feedback was negatively associated with three types of intrinsic motivation (see Table 2). Also, Deci and Ryan's (1985, 1991; Ryan & Deci, 2000) 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. Nevertheless, the non-significant effect of perceived negative nonverbal feedback on intrinsic motivation in the model confirms our hypothesis and is consistent with findings of Allen and Howe (1998), indicating that coach's nonverbal criticism did not contribute significantly to athletes' perceived competence.

Although the results of this study have provided some interesting information that point to the importance of perceived teacher behavior such as different types of perceived feedback in affecting intrinsic motivation in PE, certain limitations should be noted. First, gender differences were not addressed in this study. Differences between genders might exist and therefore investigation of this issue is needed. A second limitation concerns the instrumentation that was used in this study to measure students' perceptions of the teacher

feedback. As noted earlier, one of the subscale from the revised PTF, perceived positive nonverbal feedback, showed a level of internal consistency that was below that recommended by Nunnally (1978). Although we retained this subscale, it was suggested that caution should be used when interpreting results pertaining to this subscale.

In conclusion, the results of this study provide some support for the reliability and validity of the revised PTF for measuring both perceived verbal and nonverbal teacher feedback in a population of middle and high school students in PE. The results suggest that PE teachers should increasingly provide positive general feedback to enhance students' intrinsic motivation to engage in PE. Teachers should also consider that students' perceptions of feedback about the knowledge of performance may also be essential to increasing intrinsic motivation in PE. These findings may have important implications for teachers related to maximizing student motivation in PE.

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Table 1.

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 phys. ed., 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

Table 2.

Means, standard deviations, cronbach alpha, and corelations 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	.84	(.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. The scores on the subscales have been divided by the number of items in each subscale; 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.

Table 3.

Goodness of fit statistics for the estimated models

Models	χ^2/df	p-value	GFI	CFI	NNFI	IFI	RMSEA	Confidence interval for RMSEA
Model 1:	66.3/38	.003	.93	.93	.91	.94	.05	.03 - .06
Model 2:	23.2/8	.003	.99	.99	.97	.99	.06	.03 - .08
Model 3:	3.5/4	.475	1.00	1.00	1.00	1.00	.00	.00 - .06

Note. Model 1 = confirmatory factor analysis of the revised Perceptions of Teacher's Feedback (PTF); Model 2 = structural equation modeling of perceived teacher feedback and intrinsic motivation; Model 3 = modification of the structural equation modeling of perceived teacher feedback and intrinsic motivation; GFI = Goodness of Fit Index; CFI = Comparative Fit Index; NNFI = Non-Normed Fit Index; IFI = Incremental Fit Index; RMSEA = Root Mean Square Error of Approximation.

Figure Captions

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

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

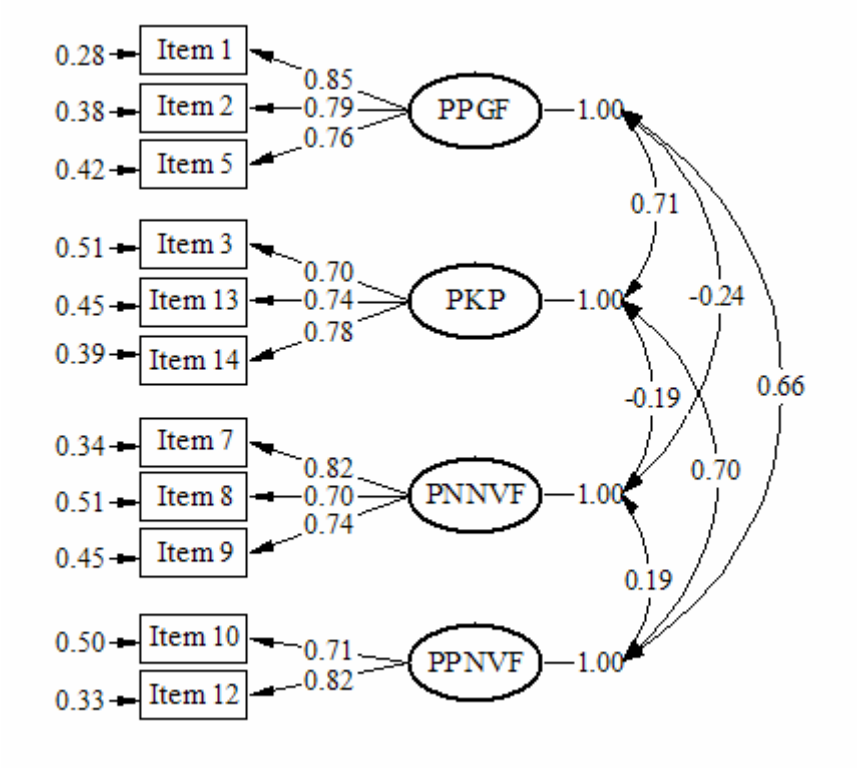
0.28
Item 1
0.85
0.38
Item 2
0.79
PPGF
1.00
0.42
Item 5
0.76
0.71
0.51
Item 3
0.70
0.45
Item 13
0.74
PKP
1.00
-0.24
0.39
Item 14
0.78
0.66
-0.19
0.34
Item 7
0.82
0.70
0.51
Item 8
0.70
PNNVF
1.00
0.45
Item 9
0.74
0.19
0.50
Item 10
0.71
PPNVF
1.00
0.33
Item 12
0.82

Figure 1

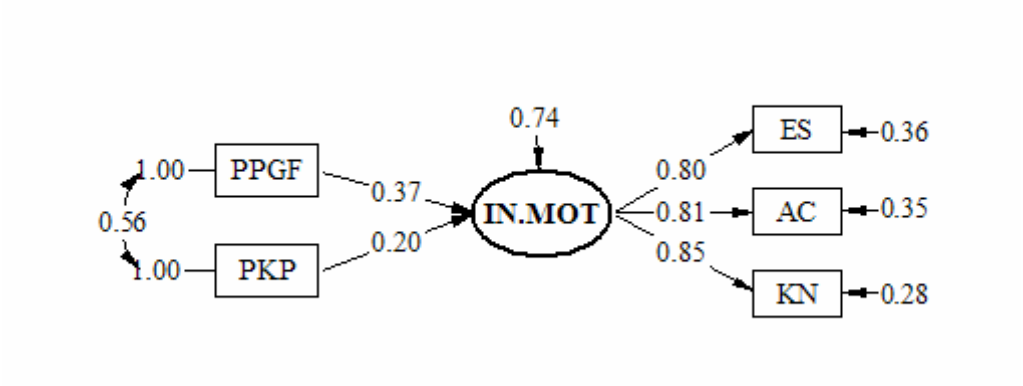
0.74
1.00
PPGF
0.37
0.56
IN.MOT
0.80
ES
0.36
0.81
AC
0.35
0.20
1.00
PKP
0.85
KN
0.28

Figure 2.