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PERCEPTIONS OF TEACHERS' GENERAL AND INFORMATIONAL FEEDBACK AND INTRINSIC MOTIVATION IN PHYSICAL EDUCATION: TWO-YEAR EFFECTS[1]

ANDRE KOKA AND VELLO HEIN

University of Tartu

Summary.—Relative change or stability of perceived positive general feedback and perceived informational feedback and their influence on students' intrinsic motivation in physical education over two years were examined. 302 students, ages 11 to 15 years, responded to the Perception of Teacher's Feedback questionnaire. Two years later, these students filled out the questionnaire again, along with a modified version of the Sport Motivation Scale. Analysis showed that both types of perceived feedback exhibited moderate stability over the two years. Perceived positive general feedback demonstrated a significant direct effect on students' intrinsic motivation measured concurrently in physical education. Further, fixing to zero the effect of perceived positive general feedback on intrinsic motivation measured concurrently, an effect emerged over the two years.

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, are associated with better motor skill acquisition (e.g., Fairweather & Sidaway, 1994; Landin, 1994; Zubiaur, Ona, & Delgado, 1999; Fredenburg, Lee, & Solmon, 2001). According to Deci and Ryan's (1985) cognitive evaluation theory, the behavior of a coach or teacher is viewed as an important social factor that might influence a learner's feelings of autonomy and competence, which subsequently may affect his motivation. Several studies based on cognitive evaluation theory have indicated positive and informational feedback enhance perceived competence and intrinsic motivation (e.g., Amorose & Weiss, 1998; Amorose & Smith, 2003). Furthermore, the effect of perceived feedback and perceived competence on intrinsic motivation in sport and physical education have also been documented (Black & Weiss, 1992; Allen & Howe, 1998; Amorose & Horn, 2000; Koka & Hein, 2003).

The motivational sequence model in which different motivational types are influenced by a number of social factors, mediated by the satisfaction of certain psychological needs such as autonomy, relatedness, and competence,

[1]Address correspondence to Andre Koka, Ph.D., Institute of Sport Pedagogy and Coaching Sciences, Faculty of Exercise and Sports Sciences, University of Tartu, 5 Jakobi Street, EE 51014 Tartu, Estonia or e-mail (andre.koka@ut.ee). This study was financially supported by the Estonian Science Foundation (Grant No. 4533). We thank anonymous reviewers for their helpful comments on a previous version of the manuscript and Dr. Martin Hagger and Dr. Nikos Chatzisarantis for their help in preparing the final version of the manuscript.

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was proposed by Vallerand (1997). Previously, the temporal relationship between perceived competence and motivation on a longitudinal basis was examined by Losier and Vallerand (1994) who noted that perceived competence was a determinant of motivation over five months. However, the authors have not excluded the possibility that with time motivation may also influence perceptions of competence. Investigation of the stability of other variables in the motivational sequence model may allow more insight in developing motivation.

Although aforementioned studies have documented that various forms of perceived coach/teacher feedback such as evaluative, informational, and positive general feedback and perceived competence are the determinants of motivation, none of these studies have examined the stability of perceived feedback over time and how these factors may be related to intrinsic motivation. Knowing the relative change or stability of students' perceptions of the teacher's feedback over time and the effect of previous perceived feedback on students' intrinsic motivation in the future, physical education teachers might select more appropriate types of feedback for motivating students to acquire skills in physical education.

In this study was examined how perceptions of positive general feedback and of instructive or informational feedback may be related to intrinsic motivation among students in middle school physical education over two years. A cross-sectional study by Koka and Hein (2003) showed that perceived positive general feedback and teachers' perceived feedback about knowledge of performance were positively correlated with 12- to 15-yr.-old students' perceived competence and intrinsic motivation in physical education. However, the regression analysis indicated that only perceived positive general feedback was a valid predictor of students' perceived competence and intrinsic motivation.

Positive general feedback may be defined as a physical education teacher's positive statement that does not specify what was good about the performance such as "You are doing great!" The predominant view is that positive general feedback enhances intrinsic motivation (Ryan & Deci, 2000). Indeed, it should be acknowledged that the way positive feedback is delivered is a crucial moderator of its effect on intrinsic motivation, and it may have an informational or controlling functional aspect (Ryan, 1982). If the feedback is administered informationally, it will increase intrinsic motivation relative to comparable feedback administered controllingly.

Instructive or informational feedback may be defined as a physical education teacher's statement that clearly informs the students of an aspect of their performance that needs to be altered to improve performance like "That was better than last time, but next time try to extend your legs, John!" Experimental studies have shown that informational performance

feedback enhances intrinsic motivation through the enhancement of perceived competence and performance (Vallerand & Reid, 1984).

According to Vallerand's (1997) theorizing about intrinsic motivation, intrinsic motivation is viewed as multidimensional in the present study, comprising intrinsic motivation to know, intrinsic motivation to accomplish, and intrinsic motivation to experience stimulation. A study by Hein, Müür, and Koka (2004) provided evidence of these three different dimensions of intrinsic motivation among students ages 14 to 18 years in physical education. In general, according to Deci and Ryan (1985) and Ryan and Deci (2000), a person is said to be intrinsically motivated when he participates in an activity for its own sake—for the pleasure derived from the performance and satisfaction of learning new skills. An extrinsically motivated person, on the other hand, participates in an activity to attain some separate, externally referenced outcome. There are a number of advantages for persons who participate in an activity for more intrinsic reasons or motives. For example, intrinsically motivated individuals are more likely to exert more effort and exhibit greater learning relative to those who are more extrinsically motivated (Weiss & Ferrer-Caja, 2002). Therefore, given benefits of participating in activities for intrinsic motives, in the present study emphasis was on the effect of perceived positive general feedback and perceived instructive or informational feedback on students' intrinsic motivation in physical education over time.

Amorose and Weiss (1998), who investigated the differences in the role of evaluative and informational feedback as a cue of perceived ability among children ages 6 to 8 years and 12 to 13 years, found that the older group was less likely to use a coach's feedback and more likely to use technique cues to rate athletes' ability than the younger group. The authors suggested that older children might have more experience and thus a more extensive knowledge base from which to draw conclusions about performance. However, this suggestion was not later supported among similar groups of ages 7 to 10 and 12 to 14 years (Amorose & Smith, 2003). In spite of these contradictory findings in the interpretation of coaching feedback, one assumes, when children grow older and have more experience in acquiring skill in physical education, the effect of different forms of perceived feedback may be differently related to intrinsic motivation. To test this a longitudinal design is needed in which data are assessed several times during adolescence. In addition, a longitudinal study design allows estimation of the causal relationship among variables, i.e., how one variable such as perceived positive general feedback at one point in time may account for another variable, like perceived instructive or informational feedback at a second or later time.

The aim of this study was to examine the relative change or stability of the perceived positive general feedback and perceived instructive or informational feedback and the influence of these constructs on students' intrinsic

motivation in physical education over 2 years. Based on previous results of Koka and Hein (2003), it was expected that perceived positive general feedback would have stronger effect on students' intrinsic motivation than perceived instructive or informational feedback. In addition, similar longitudinal effects of perceived teacher feedback on intrinsic motivation in physical education over time were expected.

Method

Participants

The participants were 302 (169 boys and 133 girls) students from five schools of similar enrollment located in the same part of town of 100,000 inhabitants in Estonia. Permission to carry out the study was obtained from the headmaster of each school or from other teachers. Parental consent was obtained for all students.

Measures

Perceptions of teacher's feedback.—To assess students' perceptions of their teacher's feedback, two subscales from the Perceptions of the Teacher's Feedback (Koka & Hein, 2003) were used. They were subscales of Perceived Positive General Feedback and perceived knowledge of performance or Perceived Informational Feedback. Three items of the Perceived Positive General Feedback subscale were "The teacher often praises me," "My work is frequently encouraged by the teacher," and "When I do well in classes, the teacher confirms that." Two items of the Perceived Informational Feedback subscale were "The teacher instructs me frequently during the performance" and "The teacher often gives me instructions." Students were asked to rate their responses on a 5-point Likert scale anchored by 5: Strongly agree and 1: Strongly disagree. In this study the perceived positive specific feedback, the third subscale from the Perceptions of the Teacher's Feedback questionnaire, was omitted because it did not have meaningful relationship with students' intrinsic motivation in the study by Koka and Hein (2003).

Sport Motivation Scale.—The modified version of the Sport Motivation Scale (Pelletier, Fortier, Vallerand, Tuson, Briére, & Blais, 1995), for measuring intrinsic motivation in physical education settings, was used (Hein, *et al.*, 2004). Participants were presented with the common stem, "I take part in physical education classes, because . . . ," followed by the items of the subscales. In the present study three intrinsic motivations were used: Intrinsic Motivation to Know, Intrinsic Motivation to Accomplish, and Intrinsic Motivation to Experience Stimulation. Four items assessed the Intrinsic Motivation to Know, e.g., "For the pleasure it gives me to know more about physical exercises," four items assessed the Intrinsic Motivation to Accomplish, e.g., "For the pleasure I feel while improving some of my weak points," and four items assessed Intrinsic Motivation to Experience Stimulation, e.g.,

"For the excitement I feel when I am really involved in the activity." Participants gave their responses on a 7-point Likert-type scale anchored by 7: Strongly agree and 1: Strongly disagree.

Procedure

Students completed the questionnaire on two occasions over a two-year period. The first time students were in Grades 6 and 8 and ages 11 to 15 years ($N=302$, $M=12.7$ yr., $SD=1.0$, Time 1). Two years later, responses were received from the same students (Time 2). At Time 1, Perceived Positive General Feedback and Perceived Informational Feedback were assessed using the Perceptions of the Teacher's Feedback questionnaire. At Time 2 these two measures were taken along with a measures of three types of intrinsic motivation using the modified version of the Sport Motivation Scale.

Questionnaires were administered in quiet classroom conditions under identical procedures. It was emphasized that the questionnaire was designed to measure students' general feelings about physical education classes and not about the one particular class. Students were assured that their answers would remain confidential. Only those who attended both Times 1 and 2 were included in the analyses ($N=302$). Students were identified by date of birth. During the two years, students took physical education as a required course. In every school the same physical education teacher taught students during the follow-up period.

Data Analysis and Model Specification

The data were analyzed using the LISREL 8.51 structural equation modeling program (Jöreskog & Sörbom, 1996). This analysis consisted of two steps. First, to support the discriminant validity of the measures used in the present study, a measurement confirmatory factor analysis was conducted. Discriminant validity between Perceived Positive General Feedback at Time 1, Perceived Informational Feedback at Time 1, Perceived Positive General Feedback at Time 2, Perceived Informational Feedback at Time 2, Intrinsic Motivation to Experience Stimulation at Time 2, Intrinsic Motivation to Know at Time 2, and Intrinsic Motivation to Accomplish at Time 2 were examined through the specification of a model in which items of the respective latent constructs were set to load on their expected factors (Mulaik & Millsap, 2000). Therefore, a 7-factor model was tested in which the latent constructs were set to correlate. The measurement confirmatory factor analysis model that assumed discriminant validity was compared with a congeneric confirmatory factor analysis model in which a single factor would explain the relationships between the items of each latent construct (Mulaik & Millsap, 2000). That model assumed lack of discriminant validity for each latent construct used in the present study. Discriminant validity of the mea-

sures is supported if the measurement confirmatory factor analysis model which assumed discriminant validity met the proposed values for indices of good fit and were superior in fit to the congeneric confirmatory factor analysis model.

A second step of the structural equation modeling consisted of the examination of the hypothesized relationships between the latent constructs. In particular, the hypothesized structural model was specified in which the stability of the Perceived Positive General Feedback and Perceived Informational Feedback over the two-year period were estimated. In addition, the model specified a direct effect of Perceived Positive General Feedback and Perceived Informational Feedback at Time 2 on intrinsic motivation measured concurrently. Also, the model specified a longitudinal direct effect of previous Perceived Positive General Feedback and Perceived Informational Feedback (Time 1) on intrinsic motivation at Time 2. Finally, the model specified reciprocal cross-lagged effects between Perceived Positive General Feedback and Perceived Informational Feedback across time and, considering the research by Koka and Hein (2003), the Perceived Positive General Feedback and Perceived Informational Feedback at both times were allowed to correlate.

Model fit was assessed by examining the comparative fit index (CFI), the nonnormed fit index (NNFI), and the root mean square error of approximation (RMSEA). With regard to the former two indices, values greater than .90 were considered to reflect an acceptable fit of the model to the data (Bentler, 1990), and values equal to or less than .08 for RMSEA were considered acceptable (Hu & Bentler, 1999). Although Hu and Bentler presented a more preferable cutoff value of .95 for CFI and NNFI, this has recently been questioned by March, Hau, and Wen (2004) who recommended that researchers not overgeneralize such cutoff criteria when evaluating goodness-of-fit on the basis of incremental fit indices.

Results

Preliminary Analyses

First, outliers were deemed outside the range of 3 standard deviations above or below the mean of the observed variables away from the means of computed corresponded latent variables and were considered for case exclusion. Based upon these analyses, the eight cases of 3 standard deviations away from the mean were excluded from the total 302 original cases, making the final sample size 294.

Prior to testing the main hypotheses, a measurement confirmatory factor analysis model which assumed discriminant validity was conducted and compared with a congeneric confirmatory factor analysis model which did not assume discriminant validity to support the fit of the measures used in

the present study. These analyses and subsequent structural equation modeling analyses were conducted with maximum likelihood method of estimation, 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. A measurement confirmatory factor analysis model that assumed discriminant validity because it let indicators of the measures load on their respective factors indicated an acceptable fit of the data (Table 1, Model 1). In contrast, a congeneric model that did not assume discriminant validity because it forced the indicators of all measures to load on the same factor demonstrated poor fit to the data (Table 1, Model 2). These results suggested that Perceived Positive General Feedback and Perceived Informational Feedback at Times 1 and 2 and three types of intrinsic motivation measured at Time 2 displayed discriminant validity. The factor intercorrelations from

TABLE 1
GOODNESS-OF-FIT STATISTICS FOR DISCRIMINANT AND CONGENERIC CONFIRMATORY FACTOR ANALYTIC MODEL AND STRUCTURAL MODELS

Model	SB-χ^2/df	CFI	NNFI	RMSEA
1: Discriminant validity model	196.66/131	.93	.91	.041
2: Congeneric model	1042.55/152	.60	.55	.141
3: Hypothesized structural model	80.87/55	.94	.91	.040
4: Controlled longitudinal structural model	92.48/56	.93	.90	.047

Note.—SB-χ^2/df = ratio of Sattora-Bentler scaled chi-square value and degrees of freedom; CFI = Comparative Fit Index; NNFI = Nonnormed Fit Index; RMSEA = Root Mean Square Error of Approximation.

the measurement confirmatory factor analysis model for the Perceived Positive General Feedback and Perceived Informational Feedback at Times 1 and 2 and the three types of intrinsic motivation at Time 2 are provided in Table 2. Factor intercorrelations showed that the three types of intrinsic motivation were strongly correlated (coefficients ranging from .84 to .88), so an average of scores on the three intrinsic motivation scales were used to identify a latent Intrinsic Motivation factor in the structural equation model.

Main Analyses

The structural equation modeling indicated that the hypothesized structural model approached the recent criteria of good fit proposed by Hu and Bentler (1999). The fit indices for the hypothesized structural model are presented in Table 1, Model 3, whereas parameters are shown in Fig. 1. The regression of the Perceived Positive General Feedback and Perceived Information Feedback on themselves over time was the test of stability. This demonstrated the relative change in the distribution of individual differences in these variables over time (Hertzog & Nessleroade, 1987). The model indicated student's stability was moderate in both Perceived Positive General

TABLE 2
DESCRIPTIVE STATISTICS AND INTERSCALE CORRELATIONS FOR PERCEIVED TEACHERS' FEEDBACK AND INTRINSIC MOTIVATION VARIABLES

	1	2	3	4	5	6	7
1. Perceived Positive General Feedback, Time 1	.69						
2. Perceived Informational Feedback, Time 1	.41*	.74					
3. Perceived Positive General Feedback, Time 2	.35*	.21*	.75				
4. Perceived Informational Feedback, Time 2	.20*	.36*	.70*	.74			
Intrinsic Motivation							
5. to Experience Stimulation, Time 2	.14	.16*	.56*	.46*	.81		
6. to Accomplish, Time 2	.16*	.12	.42*	.36*	.84*	.74	
7. to Know, Time 2	.26*	.22*	.47*	.42*	.85*	.88*	.78
M	3.16	2.89	2.98	2.82	4.18	5.00	4.99
SD	.77	.85	.86	.90	1.43	1.36	1.34

Note.—Scores on subscales divided by the number of items in each subscale; correlations significant at $p < .01$; Cronbach alphas of each subscale presented on the diagonal. Variables with consequent "Time 1" assessed during the first data collection. Variables with consequent "Time 2" measured during the second data collection.

Feedback (path coefficient = .32, confidence interval (CI95) = .13, to .48, $p <$ .01) and Perceived Informational Feedback (path coefficient = .33, CI95 = .18 to .54, $p < .01$) from Time 1 to Time 2. The results of the structural equation modeling supported the hypothesis that Perceived Positive General Feed-

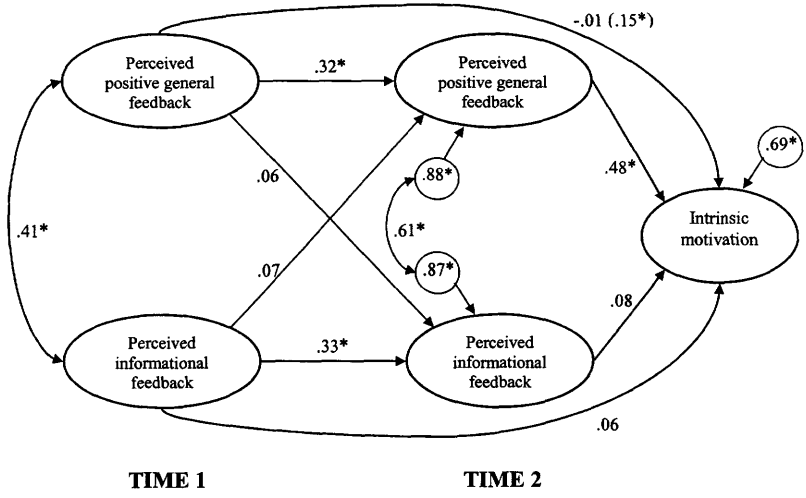

FIG. 1. This structural model illustrates relationships between Perceived Positive General Feedback, Perceived Informational Feedback, and Intrinsic Motivation in physical education across two years. Note change in the direct longitudinal path coefficient of Perceived Positive General Feedback at Time 1 → Intrinsic Motivation at Time 2 after fixing to zero the effect of Perceived Positive General Feedback at Time 2 on Intrinsic Motivation in parenthesis. *Paths are significant ($p < .01$).

back (standardized coefficient = .48, CI95 = .05 to .97, $p < .01$) at Time 2 significantly predicted students' Intrinsic Motivation measured concurrently, whereas the influence of Perceived Informational Feedback (standardized coefficient = .08, CI95 = −.30 to .46, $p > .05$) at Time 2 was not significant. Further, results indicated that two types of perceived feedback were significantly related at both time points (standardized coefficient = .41, CI95 = .25 to .58, $p < .01$, and standardized coefficient = .61, CI95 = .40 to .69, $p < .01$ for Times 1 and 2, respectively). As the Perceived Positive General Feedback and Perceived Informational Feedback measured at Time 2 are dependent variables in the structural equation model, the only acceptable way of presenting their interrelationship is to allow their residuals to be correlated (the curvy path between the residuals of perceived feedback variables at Time 2, see Fig. 1). Causal relationships or cross-lagged relationships between Perceived Positive General Feedback and Perceived Informational Feedback across time did not emerge. Perceived Positive General Feedback at Time 2 as the only significant predictor accounted for 31% of the variance in Intrinsic Motivation (see Fig. 1).

Longitudinal Effects

To test the direct effect of Perceived Positive General Feedback at Time 1 on Intrinsic Motivation at Time 2, the effect of Perceived Positive General Feedback at Time 2 on Intrinsic Motivation measured concurrently, as the only significant predictor of Intrinsic Motivation, was fixed to zero. If the direct longitudinal coefficient in such a restricted model is significant, there is confirmation of the longitudinal direct effect of Perceived Positive General Feedback on students' Intrinsic Motivation in physical education. Change in the longitudinal direct path coefficient as a result of fixing the effect of Perceived Positive General Feedback at Time 2 on Intrinsic Motivation is shown in parenthesis in Fig. 1. The analysis indicated that Perceived Positive General Feedback at Time 1 had significant longitudinal direct effect on students' Intrinsic Motivation in physical education (standardized coefficient = .15, CI95 = .01 to .31, $p < .01$). As shown in Table 1, Model 4, this restricted model also approached the recent criteria of good fit (Hu & Bentler, 1999).

Discussion

This study examined the relative change or stability of Perceived Positive General Feedback and Perceived Informational Feedback over the 2-yr. period and tested the effects of these types of perceived teacher's feedback on students' Intrinsic Motivation in physical education. The analysis also examined direct effect of previous Perceived Positive General Feedback on Intrinsic Motivation two years later and the causal relationship between two perceived feedback types. Findings indicated that students' perceptions of

both types of teachers' feedback demonstrated equally moderate stability over the two-year period, whereas Perceived Positive General Feedback at Time 2 had significant effects on students' Intrinsic Motivation in physical education measured concurrently. In cross-lagged regressions there were no reciprocal relationships between Perceived Positive General Feedback and Perceived Informational Feedback between Times 1 and 2. Also, the alternative longitudinal structural model supported a longitudinal direct effect of Perceived Positive General Feedback at Time 1 on later Intrinsic Motivation in physical education.

First, a confirmatory factor analysis indicated that the Perceived Positive General Feedback and Perceived Informational Feedback at both time points and three types of intrinsic motivation at Time 2 elicited different patterns of responses. This result suggested the measures assessed distinct constructs and displayed discriminant validity. However, correlations showed that interrelations among the three types of intrinsic motivation were strong, so averaged scores of the three types of intrinsic motivation were used as a latent intrinsic motivation factor in the hypothesized structural model.

The results of the structural equation modeling in the present study fit Vallerand's model of motivation and the basic tenets of cognitive evaluation theory, suggesting that individuals' motivations towards activity are influenced by a number of social factors such as teachers' or coaches' feedback (Deci & Ryan, 1985; Vallerand, 1997; Ryan & Deci, 2000). Consistent with expectations, while having moderate stability over the two years, Perceived Positive General Feedback at Time 2 had a significant positive association on students' Intrinsic Motivation in physical education. Although Perceived Informational Feedback also exhibited moderate temporal stability, it did not significantly enhance students' Intrinsic Motivation, as suggested by previous studies in sport domain (e.g., Black & Weiss, 1992; Amorose & Horn, 2000). Nevertheless, given the nonsignificant direct effect of perceived informational feedback in this study, physical education teachers should not refrain from giving feedback that contains information about a student's performance and how to improve upon it the next time. Such information is continuously needed to facilitate higher learning. Such teachers' behavior would keep intrinsic motivation in physical education from being low as students would be given informational feedback. One should, however, acknowledge that Perceived Informational Feedback enhances Intrinsic Motivation through change in perceived competence and performance. Both Deci and Ryan's (1985) cognitive evaluation theory and Vallerand's (1997) motivational model postulate that social-contextual factors such as feedback from significant others influence individuals' needs for competence and self-determination, which in turn contribute to intrinsic motivation. Research on physical activity has supported perceived competence as mediating the relation-

ship between informational performance feedback and intrinsic motivation (Vallerand & Reid, 1984). The perceived competence, however, was not measured in the present study and should be considered a limitation.

Despite the relative instability of the Perceived Positive General Feedback and Perceived Informational Feedback over the two years, the structural equation modeling suggested that the greatest proportion of variance in the Intrinsic Motivation was explained by the model in which stability effects of both perceived feedback types was not restricted. Although, longitudinal direct effect of previous Perceived Positive General Feedback on later Intrinsic Motivation appeared while fixing to zero the effect of Perceived Positive General Feedback at Time 2 on Intrinsic Motivation measured concurrently, the results seem to suggest that the influence of previous Perceived Positive General Feedback (Time 1) on later Intrinsic Motivation was best explained via the Perceived Positive General Feedback at Time 2. The role of recent perception of the teacher's feedback is important in mediating the effect of previous perception of the teacher's feedback on later intrinsic motivation. However, physical education teachers should also acknowledge that the positive general feedback perceived previously by students may also have some direct effect on students' intrinsic motivation to participate later in physical education.

Although the present results provided evidence for a positive effect of the perception of teachers' positive feedback on students' intrinsic motivation over the two years, one must be cautious about generalisability of the present study. First, this study did not include variables like perceived negative feedback, such as criticism and both nonverbal negative and positive feedback by a teacher, which would have given a more comprehensive view and useful information for researchers and teachers. That negative feedback from a teacher diminishes students' intrinsic motivation (Deci & Ryan, 1985; Ryan & Deci, 2000) has been confirmed, but the relative change or stability of perceived negative feedback and also nonverbal feedback over time have not been assessed. Second, the inclusion of students' perceptions of competence would have strengthened this design.

In conclusion, the findings suggest that, over the two-year period, students showed some stability in perceptions of both positive general and informational feedback by a teacher in physical education. Teachers positively stated feedback can enhance students' intrinsic motivation in physical education. Also, teachers should bear in mind that previous positive perceived feedback may affect later intrinsic motivation.

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