Journal of Sport & Exercise Psychology, 2008, 30, 240-268

The Motivating Role of Positive Feedback in Sport and Physical Education: Evidence for a Motivational Model

Athanasios Mouratidis,[1] Maarten Vansteenkiste,[2] Willy Lens,[1] and Georgios Sideridis[3]

[1]University of Leuven, [2]Ghent University, [3]University of Crete

Based on self-determination theory (Deci & Ryan, 2000), an experimental study with middle school students participating in a physical education task and a correlational study with highly talented sport students investigated the motivating role of positive competence feedback on participants' well-being, performance, and intention to participate. In Study 1, structural equation modeling favored the hypothesized motivational model, in which, after controlling for pretask perceived competence and competence valuation, feedback positively predicted competence satisfaction, which in turn predicted higher levels of vitality and greater intentions to participate, through the mediation of autonomous motivation. No effects on performance were found. Study 2 further showed that autonomous motivation mediated the relation between competence satisfaction and well-being, whereas amotivation mediated the negative relation between competence satisfaction and ill-being and rated performance. The discussion focuses on the motivational role of competence feedback in sports and physical education settings.

Keywords: motivation, physical education, feedback, self-determination theory

Optimal motivation for doing sports and engaging in physical activities is important for good physical and psychological health (Biddle, Sallis, & Cavill, 1998). Optimal motivation can be defined as consisting of high quality and a high level of motivation (Vansteenkiste, Lens, & Deci, 2006). Drawing upon self-determination theory (SDT; Deci & Ryan, 2000), we consider high quality of motivation as the self-endorsed and autonomous engagement in a physical activity and a high level of motivation as the extent to which one is motivated to put effort in such activities. Furthermore, in line with SDT, we assume that the satisfaction of the basic psychological needs for autonomy (i.e., volition), competence (i.e., effectiveness), and relatedness (i.e., belongingness) is crucial for fostering high

Mouratidis and Lens are with the Department of Psychology, University of Leuven, Leuven, Belgium; Vansteenkiste is with the Department of Psychology, Ghent University, Ghent, Belgium; and Sideridis is with the Department of Psychology, University of Crete, Crete, Greece.

quality of motivation and that the satisfaction of the basic need for competence is especially important in explaining quantity (i.e., high level) in motivation.

In the current study, we focused on the satisfaction of the need for competence and tested a motivational model consisting of a sequence of motivational processes. Specifically, positive competence feedback by physical education (PE) teachers (Study 1) or sport coaches (Study 2) was expected to predict the satisfaction of the need for competence, which, in turn, would be associated with various positive outcomes (i.e., higher well-being, lower ill-being, greater intentions for future participation, and better performance) through fostering optimal (i.e., better and stronger) motivation. We tested this motivational model in an experimental field study thereby using an ecologically valid PE task (i.e., a shuttle-run task) and in a correlational study among top sport high school students with high potential. Thus, our aim was to cross-validate the motivational model in two different domains (i.e., sports and PE), thereby using two different methodologies (i.e., experimental and correlational). We begin by providing a brief overview of previous studies on the role of positive competence feedback in the prediction of intrinsic motivation and free-choice persistence followed by studies conducted within sports and PE settings.[1]

Studies on Positive Competence Feedback

Within SDT, autonomous or volitional motivation yields two subcomponents, intrinsic motivation and well-internalized extrinsic motivation. *Intrinsic motivation* refers to the engagement in an activity for its own sake, that is, because the activity is by itself interesting and enjoyable. *Well-internalized extrinsic motivation* refers to the engagement in an activity for which people have accepted the personal relevance for their own self.

A broad variety of experimental studies conducted mainly from the SDT perspective examined the influence of competence feedback on intrinsic motivation. In one of the first studies on this topic, Deci (1971) showed that providing positive feedback to undergraduate students resulted in more intrinsically motivated free-choice persistence compared with a no-feedback control group. Subsequent studies (Deci, 1972; Deci, Cascio, & Krusell, 1975) replicated this finding, but equally showed that male participants benefited more from receiving positive feedback than female participants. Anderson, Manoogian, and Reznick (1976) also evidenced the motivating impact of positive feedback on task engagement among preschool children (instead of adolescents), thereby using a highly ecological valid task (i.e., drawing color pictures). Coming from a somewhat different theoretical perspective, Harackiewicz (1979) and Butler (1987) experimentally demonstrated that positive feedback, relative to no feedback, resulted in higher self-reported enjoyment, more free-choice persistence, and a greater interest for doing more of the same activity in the near future.

The meta-analytical review by Deci, Koestner, and Ryan (1999) further confirmed that positive feedback (termed *verbal rewards*) has a small-to-moderate positive effect on self-reported interest (Cohen's $d = .31$) and behavioral free-choice behavior (Cohen's $d = .33$), although the latter effect applied only to college students and not to children. Additional experimental work in the 1980s identified factors

that moderate the impact of positive competence feedback. Ryan (1982) found controlling positive feedback (i.e., "you did as I expected it you to perform") to predict less intrinsic liking of the task and subsequent free-choice behavior compared with informational positive feedback (i.e., "you did well on this task"). Those results indicate that experiencing a sense of competence satisfaction—as a result of getting positive feedback—is more likely to foster intrinsic motivation when it is coupled with the satisfaction of the need for autonomy (see also Kast & Connor, 1988; Pittman, Davey, Alafat, Wetherill, & Kramer, 1980). Apart from the style of presenting positive feedback, Henderlong and Lepper (2002) suggested that positive feedback is more likely to enhance intrinsic motivation (a) if it is perceived as honest by the recipient; (b) if success is attributed to effort and strategy use instead of abilities; (c) if it emphasizes self-referenced improvement and learning rather than social comparison (e.g., Butler, 1987); and (d) if the standards one needs to surpass to gain positive feedback are clear, specific, and not excessively high. Other factors, including the perceived credibility, prestige, trustworthiness, proficiency, and assuredness of the feedback provider as well as the timing and type of feedback (a focus on the number of errors or correct aspects of performance) might moderate the impact of positive feedback on the activity related intrinsic interest as well (Bandura, 1977; Magill, 1998).

Other studies have provided evidence for the explanatory role of competence satisfaction in the relation between positive feedback and intrinsic motivation. For instance, Harackiewicz, Manderlink, and Sansone (1984) indicated that stronger, compared with milder, positive feedback, resulted in higher perceptions of competence during a pinball game task, and Jussim, Soffin, Brown, Ley, and Kohlhepp (1992) found positive, compared with negative, performance-related feedback to predict higher perceptions of competence for an anagram task. Vallerand and Reid (1984) found perceived competence to fully account for the observed positive effect of positive feedback versus negative feedback or no feedback on self-reported intrinsic motivation in a motor task (see also Sansone, 1989).

In the 1990s and more recently, researchers extended previous work by conducting either large cross-sectional studies in real-life settings to further validate the results obtained in the laboratory, or by including additional outcomes compared with just using intrinsic motivation. In doing so, intrinsic motivation was often combined with identified motivation to form a composite score of autonomous motivation. For instance, in a recent large-scale study with German and American college students belonging to four different universities (Levesque, Zuehlke, Stanek, & Ryan, 2004), teachers' positive feedback was found to positively predict students' well-being through the mediating role of perceived competence and autonomous motivation, although autonomous motivation only emerged as a mediator in two (i.e., one German and one American subsample) out of four universities.

Grouzet, Vallerand, Thill, and Provencher (2004) provided evidence for a similar motivational sequence by using an experimental design. Specifically, using a hidden-figure puzzle experimental task, they showed that positive, relative to negative, feedback predicted enhanced perceptions of competence and autonomy. The satisfaction of these two needs was found to affect self-determined motivation, which, in turn, predicted concentration and future behavioral intentions. In the study by Grouzet et al. (2004), self-determined motivation was created by positively weighting the two subtypes of autonomous motivation, that is, intrinsic

motivation (+2) and identified regulation (+1), and negatively weighting controlled motivation (–1) and amotivation (–2). Although this approach of estimating self-determined motivation is well documented, it does not separate quality of motivation (i.e., autonomous vs. controlled motivation) and quantity of motivation (i.e., amotivation) so as to examine their unique mediating roles in the relation between competence feedback and specific outcomes. We aimed to investigate this issue in the present research.

Competence Support in Physical Education and Sports

Within the realm of physical activity settings, a growing body of research has provided evidence for the influential role of positive feedback on perceptions of competence and intrinsic motivation (Nicaise, Cogerino, Bois, & Amorose, 2006; Reinboth, Duda, & Ntoumanis, 2004; Schunk, 1995). In a first series of studies, Weinberg and colleagues (Weinberg & Jackson, 1979; Weinberg & Ragan, 1979) found that the manipulation of feedback in terms of success versus failure positively influenced university students' intrinsic motivation. Subsequent experimental work extended these findings by conducting field experiments and by using ecologically valid tasks. For instance, Whitehead and Corbin (1991), using a shuttle-run task similar to the one used in the present research, showed that strong positive versus strong negative feedback (i.e., informing performers that they were ranked either in the 80th or the 20th percentile, respectively) positively affected intrinsic motivation through perceptions of competence. Several other field studies using tasks as diverse as running over hurdles (Escarti & Guzman, 1999), throwing darts (Bindarwish & Tenenbaum, 2006), running (Gernigon, & Delloye, 2003), and shooting using guns or using computers (Gernigon, Fleurance, & Reine 2000) and employing as diverse samples as cricket athletes (Woodcock & Corbin, 1992) and running athletes (Gernigon, & Delloye, 2003) have replicated this pattern of results.

The findings concerning the effect of positive feedback on actual performance are less consistent. Whereas some studies (e.g., Bindarwish & Tenenbaum, 2006; Gernigon & Delloye, 2003) reported no effects, other studies found a facilitating effect of positive feedback on performance (e.g., Escarti & Guzman, 1999). Several other studies did not include performance as an outcome measure (e.g., Vallerand & Reid 1984; Whitehead & Corbin, 1991).

The link between feedback received from PE teachers and students' perceived competence has been confirmed also in correlational studies. Koka and Hein (2003) found that perceived positive teacher feedback predicted students' perceptions of competence and intrinsic motivation. The sport literature is equally replete with evidence of the important role of coaches' positive feedback on athletes' perceived competence and intrinsic motivation (Amorose & Horn, 2000; Chelladurai & Saleh, 1980). In a sample of young athletes from various sports, Amorose and Horn (2000) indicated that the coaching style consisting of consistent positive, supportive, and informational feedback predicted interest, enjoyment, and perceived competence. Likewise, Allen and Howe (1998) found that informative positive as well as encouraging feedback after mistakes was related to perceived competence and satisfaction in female hockey players. Similar results were reported by Price and Weiss (2000) in a sample of female soccer players.

To summarize, a substantial number of experimental and correlational studies indicate that positive competence feedback yields a significant impact on motivation in PE and sports settings. In light of this clear evidence, the question that needs to be addressed is how the present research can still contribute to this literature. We turn toward this question in the next section.

The Present Research

Self-determination theory suggests that an environment that satisfies individuals' innate psychological needs for autonomy, competence, and relatedness will lead to optimal motivation (herein defined as the combination of good quality and high quantity of motivation) for physical activities. A number of previous studies within sports (e.g., Reinboth et al., 2004), PE (e.g., Standage, Duda, & Ntoumanis, 2005), and exercise (e.g., Edmunds, Ntoumanis, & Duda, 2006) have provided evidence for these claims.

The present study focuses on one specific aspect of this need-supportive environment, that is, the provision of positive feedback. In doing so, we extended previous work by examining a motivational model depicted in Figure 1, which was tested through structural equation modeling (SEM). Specifically, we examined whether the satisfaction of the need for competence, as a result of receiving positive feedback, would energize a more autonomous regulation of one's activity engagement, which, in turn, would be associated with greater intentions to participate in the activity in the future (Study 1), higher well-being (Study 1 and 2), and higher performance (Study 1 and 2). Thus, different from most previous work on competence feedback but similar to Levesque and colleagues (2004), we did not model intrinsic motivation as an outcome, but considered it, in conjunction with identified motivation, as a mediator in the full motivational sequence between positive competence feedback and competence satisfaction on the one hand and well-being, ill-being, future-time participation intentions, and performance on the other hand.

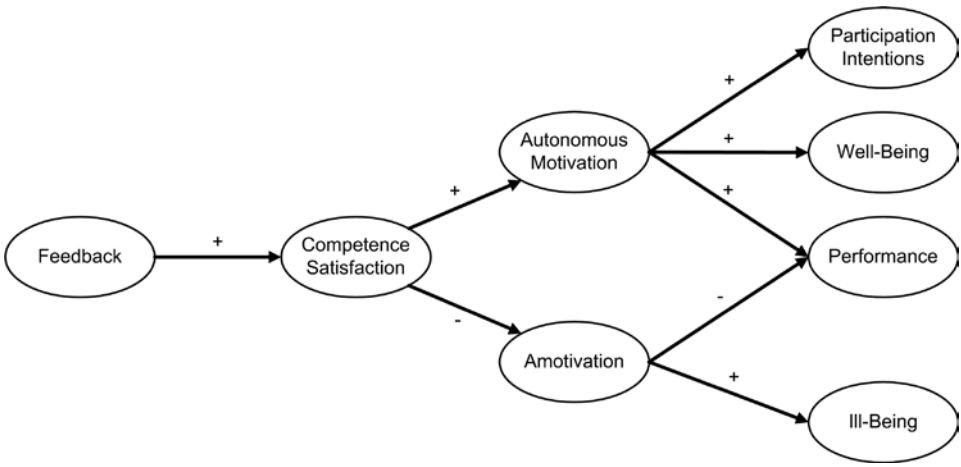

Figure 1 — The hypothesized motivational model to be tested in Studies 1 and 2.

An additional feature of Study 2 involved the inclusion of amotivation (i.e., low amount of motivation), along with autonomous motivation (i.e., high quality of motivation), as an explanatory mechanism between competence satisfaction and outcomes. To our knowledge, there is only one study to date (Legault, Green-Demers & Pelletier, 2006; their Study 3) that directly looked at the effects of competence feedback on amotivation. Legault et al. (2006) found teacher competence support to negatively predict amotivation, but, unlike in the present research, amotivation was not modeled as a process variable in a sequence of motivational variables. It seems important to examine the beneficial effects of positive competence feedback not only because feedback fosters a qualitatively different type (i.e., more autonomous) of task engagement but also because it facilitates a quantitatively stronger intention for such engagement, thereby preventing one from becoming demotivated. We predicted that both quality and quantity of motivation would play an explanatory role.

Following Vallerand's (2001) recommendations, we suggest that feelings of helplessness and their contingent perceptions of amotivation would be especially predictive for negative outcomes, such as ill-being, which was included as an additional outcome in Study 2. The motivational model depicted in Figure 1 was tested in an experimental field study (Study 1), and its external validity was further examined in a correlational study among a highly selective sample of skilled top sport students (Study 2).

Study 1

We set up an experimental study to examine whether the experimental provision of positive competence feedback would result in higher perceived competence, which, in turn would activate the motivational sequence depicted in Figure 1. Apart from testing this sequence, we aimed to replicate some previous findings and examine their viability to the PE contexts through a more stringent methodological approach. First, in line with Harackiewicz et al. (1984), we used a relatively subtle manipulation of competence support by creating a strong versus mild positive feedback condition instead of positive versus no feedback or a positive versus negative feedback manipulation. By doing so, we aimed to investigate the minimal condition under which a cause—that is, feedback—has an effect on outcomes in PE contexts (Prentice & Miller, 1992). Second, we used an ecologically valid task, namely, a shuttle-run task, which is often used during PE classes to test pupils' physical fitness. Participants performed three different trials of the same shuttle-run activity and were given strong or mild positive feedback after each trial. Third, we took into account students' pretask perceived competence for the shuttle-run task as well as their competence valuation. Competence valuation assesses the extent to which one values doing well on an activity and is assumed to lead to more adaptive forms of motivation. Previous research has shown that competence valuation is an important predictor of experienced enjoyment during the actual activity (e.g., Elliot et al., 2000). Finally, we analyzed our results using rigorous multivariate statistical techniques (SEM), which allowed examination of the interrelationships between latent variables compared with the item-level analyses commonly encountered using multiple regression analyses.

We formulated the following hypotheses. Based on SDT, we first hypothesized that strong relative to mild positive feedback would positively influence students' perceived competence and, hence, the satisfaction of their need for competence, which, in turn, would increase their task-related autonomous motivation. This increased autonomous motivation would, in turn, enhance students' sense of energy and vigor (i.e., vitality), their willingness to engage in the same activity on future occasions, and their performance. Second, we expected that this model would hold even after controlling for pretask levels in perceived competence and competence valuation. Third, as in previous research (Elliot et al., 2000), we anticipated that competence valuation would predict autonomous motivation but that it would not cause any changes in competence perceptions; therefore, we predicted no path between competence valuation and posttask competence perceptions. We also examined two ancillary moderator hypotheses. First, the assessment of competence valuation prior to engagement allowed us to examine whether the provision of strong relative to mild positive feedback would yield a stronger effect for individuals high on competence valuation, that is, for those who value doing well on the activity more. Second, previous research (Nicaise et al., 2006) has shown that the effects of PE teachers' feedback are stronger for boys than for girls. Thus, given the potential differential effects of feedback on the two genders (Deci et al., 1975), we also examined the possible moderating role of gender.

Method

Participants and Procedures

One hundred seventeen male and 111 female Greek middle school students (7th- to 9th-grade) from five different schools voluntarily participated in the study. Their age ranged between 12.2 and 17.0 years, with a mean age of 13.78 years (SD = 0.93). The experiment took place during PE lessons at school. The experimental manipulation was conducted on an individual basis, in private, and in a specially designated area of the schoolyard. The study was originally approved by the corresponding Pedagogical Institute and the Greek Ministry of Education, and parental consent was provided for all participants.

To control for previous task experience, we used an ecologically valid physical task, which did not require expertise or any special skills. Students were introduced to the shuttle-run task, and the distance they would have to run. Two lines, 10 m apart from each other, were drawn on the ground. The first line served as the start and finish line; the second line was 10 m long and three cones were positioned on it. These three cones were 5 m away from each another. The experimenter demonstrated and at the same time explained the task to the participant. Participants stood behind the starting line and upon hearing a signal from the experimenter, they needed to run as fast as possible and first touch the middle cone on the second line; then, participants needed to head for the right to touch the second cone. After touching it, participants were to turn around, change direction, and run toward the third cone placed on the opposite side. Then, they had to turn around one more time, change direction, and head for the middle cone. After touching the middle

cone, participants had to turn right and head back to cross the finish line from where they had started. In total, the distance to be covered was 40 m.

Before starting the shuttle-run task, participants were asked to report how much they valued doing well on the activity (i.e., competence valuation) and how confident they felt about doing well. After completing those self-reports, and just before starting the activity, the experimenter reviewed the whole process and further informed the participants that the shuttle run task required speed, agility, reaction time ability, and concentration. Participants were then notified that they needed to do the task three times and that between each trial they would have a 1-min interval to recuperate. We asked students to perform three separate trials (a) to investigate whether there would be any changes in performance over time and (b) to strengthen our feedback manipulation, as participants received condition-bounded feedback after each consecutive trial. Participants were instructed to run as fast as possible and were told that upon completion of the three trials, they needed to fill in a questionnaire. It was emphasized that they were free to quit the task at anytime.

Participants were randomly assigned to one of two conditions (strong vs. mild positive feedback). To prevent them from being informed from their classmates about the nature and the aims of the study, participants were recruited from a large number ($N = 64$) of PE classes. After each trial, the experimenter monitored students' performance (running time), pretended to look at a norm table, and, regardless of the real running time, provided strong or mild positive feedback depending on the condition. In the strong positive feedback condition, participants were told the following after the first trial: "According to your first time, your performance seems exceptionally good; actually, if you go on in this way throughout the rest of the trials you will be ranked among the best performers. So, try to do your best and go on in this way to maintain, if not improve, your time and, hence, your ranking." Participants were provided similar feedback after the second trial and were told the following after the third trial: "Congratulations! You have been classified among the best performers. Well done!"

In the mild positive feedback condition, participants were told the following after the first trial: "According to your first time, your performance is average; actually, if you go on in this way throughout the rest of the trials you will be ranked among the average performers, that is, neither among the best, nor among the worst performers. This is OK. So, try to do your best and improve your time and, hence, your final ranking." After providing similar feedback after the second trial, the experimenter said the following after the third trial: "Well, that's OK! Taking into account your average performance across the three trials, you have been classified among the average performers. That's OK!"

After the three trials, the participants were given 2 min of rest and they then filled in the main questionnaire. Upon completion of the questionnaire, participants were thanked for their participation. It was explained to them that the aim of the study was to investigate their views about PE-related tasks that they normally encounter during regular PE classes. Students were also reassured that all their answers would remain confidential. At the end of the session, the experimenter asked participants assigned to the mild positive feedback condition to excuse him, because he had mistakenly told them that their performance was average. This was

done to take away the irritation and negative feelings that might have arisen among participants in the mild positive feedback condition.

Measures

Competence Valuation. Competence valuation assesses the extent to which individuals value doing well on an upcoming task (Elliot & Harackiewicz, 1996). It was measured with a three-item scale (e.g., "It is important to me to do well on this task"; $\alpha = .80$) and participants needed to report their agreement with each of the three items on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Pretask Perceived Competence. Students rated their perceived competence for doing the upcoming task on a 7-point Likert scale, which ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). Cronbach alpha of this three-item scale was .85 (e.g., "I feel confident in my ability to do well in this task").

Performance Evaluation. Adapted from Reeve and Deci (1996), the item "How poorly or well did you do on the task?" was used as a manipulation check. Participants responded to this item on a 7-point scale, which varied from 1 (*very poor)* to 7 (*very well*).

Perceived Competence. Four items, adapted from the corresponding subscale of the Intrinsic Motivation Inventory (McAuley, Duncan, & Tammen, 1989), were combined to form participants' competence perceptions after the task (e.g., "I think I am pretty good at this type of activities"; $\alpha = .80$) and was used as an indicator of the satisfaction of their competence need. Answers were given on a 7-point Likert scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Autonomous Motivation. In line with Ryan and Connell (1989), participants were asked to indicate on a 4-point Likert scale, ranging from 1 (*not at all true*) to 4 (*very true*), the extent to which they had engaged with the shuttle-run task for (a) intrinsic reasons (e.g., "Because I enjoyed it"; four items, $\alpha = .80$) or (b) identified reasons (e.g., "Because it is important to me to try", four items, $\alpha = .77$). As in previous research (e.g., Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004), an autonomous motivation composite score was created by averaging intrinsic and identified motivation ($\alpha = .83$).

Subjective Vitality. Vitality assessed the extent to which participants felt energetic and active as a result of their participation in the PE activity and was used as an index of well-being. Five items were adapted from Ryan and Frederick's (1997) relevant scale for the current study (e.g., "I feel energized"; $\alpha = .88$). Responses were given on a 7-point scale (1 = *strongly disagree*; 7 = *strongly agree*).

Free-Choice Behavioral Intention. Three questions tapped participants' intention to perform similar activities in the future. Participants were asked whether they were interested (a) in participating in similar activities in the upcoming month, (b) in joining a group which would demonstrate the task to other classmates in the upcoming month, and (c) in getting more information from the experimenter about similar activities. Participants reported their agreement (*yes*) or disagreement (*no*) with each of these questions. The three items were then summed to form a

measure of participants' free-choice behavioral intention (for a similar method, see Vansteenkiste, Simons, Soenens, & Lens, 2004). The internal consistency of this three-item scale was .62.

Performance. Students' performance time (in seconds) across the three trials was recorded. Given that feedback manipulation started after Trial 1 (T1), T1 performance time served as a baseline measure of individuals' differences in running time. Performances T2 and T3 constituted the relevant dependent measures because these time measures were recorded after the provision of mild or strong positive feedback.

Results

Preliminary Analyses

A one-way multivariate analysis of covariance (MANCOVA) with pretask competence perceptions and competence valuation entered as covariates was conducted to examine the feedback effect on evaluation performance (i.e., the manipulation check) and on posttask competence perceptions, autonomous motivation, subjective vitality, and intentions to persist in the future. Significant differences were found between the two conditions, Pillai's trace = .49, $F(5, 213) = 40.29$, $p < .01$, $\eta^2 = .49$. Analyses of covariances (ANCOVAs) on each dependent variable were conducted as follow-up tests. Using the Bonferroni method, each ANCOVA was tested at the .01 level. Significant were the ANCOVAs for evaluation performance $F(1, 217) = 175.79$, $p < .001$, $\eta^2 = .45$; posttask competence perceptions, $F(1, 217) = 75.34$, $p < .001$, $\eta^2 = .26$; and autonomous motivation, $F(1, 217) = 10.77$, $p < .001$, $\eta^2 = .05$. In contrast, nonsignificant were the ANCOVAs for subjective vitality, $F(1, 217) = 3.71$, $p = .06$, and intentions to persist in the future, $F(1, 217) = 4.70$, $p = .03$. Although the positive effect of positive feedback on self-reported autonomous, and more correctly, on intrinsic motivation is in line with the meta-analysis of Deci et al. (1999), the null finding on intention to partake in the future is inconsistent with the results of the meta-analysis.

A repeated-measures ANOVA was conducted to assess whether there were any differences between pre- and posttask competence perceptions resulting from manipulated feedback. Results indicated a significant main effect for pretask perceived competence $F(1, 222) = 39.77$, $p < .01$; feedback $F(1, 222) = 15.90$, $p < .01$, $\chi^2 = .07$; and their interaction $F(1, 222) = 51.42$, $p < .01$. Taking into account the interaction effects, a paired-samples t test was conducted to follow up the significant main effect of feedback for the two conditions. Inspection of the differences in mean scores between pre- and posttask perceived competence for the two conditions showed significant differences for the mild positive feedback condition—$t(98) = 7.97$, $p < .01$ $M_{dif} = -1.03$, $SD = 1.28$, 95% confidence interval: –0.77 to –1.28), but not for the strong positive feedback condition—$t(125) = 0.74$, $p = .46$ $M_{dif} = 0.07$, $SD = 1.00$, 95% confidence interval: –0.11 to 0.24, thereby suggesting that the mild positive feedback manipulation thwarted participants' need satisfaction. Therefore, the effect of manipulated feedback on competence satisfaction was carried primarily by the significant decrease in competence satisfaction for those receiving mild positive feedback. We return to this issue in the brief discussion.

Concerning the effects of feedback on T2 and T3 performance times after controlling for T1 performance time, neither a MANCOVA nor a repeated-measures analysis showed significant differences between the two feedback conditions—Pillai's trace = .00, $F(2, 211) = .27$, *ns* for MANCOVA, and Pillai's trace = .00, $F(1, 212) = .55$, *ns* for repeated measures analysis), indicating that the feedback had no effect on change in performance.

Table 1 shows the means and the standard deviations of the scales and the intercorrelations among the variables. Pretask perceptions of competence and competence valuation were highly correlated, suggesting that participants who felt competent to do well on the task also highly valued doing well on the task. Both competence valuation and pretask competence perceptions were positively correlated with posttask competence perceptions, autonomous motivation, vitality, and the intentions to participate in the future. Posttask perceived competence was also moderately and positively correlated with autonomous motivation and the two self-reported outcomes, all of which were positively interrelated. Once taking into account T1 performance outcome, T2 and T3 performance outcomes were unrelated to any of the final outcomes.

Primary Analyses

Although the feedback manipulation yielded only a direct effect on competence satisfaction and autonomous motivation, it is well possible that the other outcomes in the motivational model were activated indirectly through the effects of feedback manipulation on competence satisfaction and autonomous motivation. To examine this, we used SEM. In doing so, we only included intentions to participate in the future and vitality as these two outcomes were found to be positively related to autonomous motivation. In contrast, because performance was unaffected by the feedback manipulation and unrelated to either autonomous motivation or competence satisfaction, it was removed from the motivational model. In addition, although the current effects of the manipulation were primarily driven by the undermining effect of mild positive feedback, we preferred for clarity of presentation to code the feedback effect in a way that positive feedback would positively predict positive outcomes.

Because rules of thumb about cutoff values can mislead one regarding the correct decision about the degree of specification (or misspecification) of a certain model (Marsh, Hau, & Wen, 2004), in the current study we used as reference points the cutoff values proposed by Hu and Bentler (1999): These were >.95 for CFI, <.05 for RMSEA, and <.08 for SRMR. In addition, during comparison of nonnested models, we examined the model's parsimony through the Akaike information criterion (AIC). Low values in AIC signify parsimonious and, hence, better models (easier to generalize).

All scales yielded reasonable fit indices, and data analyses evidenced nonnormal distributions (Mardia's normalized coefficient of >3.0). Therefore, CFA and SEM analyses were conducted under maximum likelihood robust estimation by using the Sattora–Bentler chi-square (S-B χ^2) index. Concerning the two subscales with only three items (pretask competence and competence valuation) and the higher-order scale of autonomous motivation (consisting of intrinsic motivation and identified regulation), we imposed additional constraints so as to overidentify

Table 1 Means, Standard Deviations, and Bivariate Correlations among the Measured Variables of Study 1 (*N* = 227)

Variables	Range	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Competence valuation	1–7	5.15	1.19	—								
2. Pretask competence	1–7	5.29	1.18	.59**	—							
3. T1 performance	9.60–14.85	12.00	1.10	−.07	−.22**	—						
4. Posttask competence	1–7	4.85	1.17	.28**	.42**	−.20**	—					
5. Autonomous motivation	1–4	3.44	0.42	.47**	.25**	.03	.30**	—				
6. Subjective vitality	1–7	5.45	1.26	.45**	.34**	.06	.34**	.47**	—			
7. Intentions to participate	0–3	2.44	0.87	.45**	.34*	−.12	.25**	.43**	.44**	—		
8. T2 performance	9.49–17.01	11.82	1.14	−.08	−.23**	.90**	−.24**	.00	.07	−.12	—	
9. T3 performance	9.38–14.84	11.80	1.05	−.06	−.23**	.89**	−.20**	.03	.06	−.11	.93**	—

**$p < .01$, *$p < .05$.

the model (Byrne, 1994; Kline, 2005). Specifically, for the three-item scales, we constrained two error variances of each scale to equality. Regarding the identification of the higher-order structure of autonomous motivation, we constrained the variances of the two disturbances (i.e., errors of latent variables) to equality. In addition, we fixed both loadings of intrinsic motivation and identified regulation to the latent factor of autonomous motivation. These constraints were kept constant throughout all subsequent analyses. Taking into account that CFA for all the scales was satisfactory, the measurement model showed an excellent fit, S-B $\chi^2(312) = 355.44$, $p = .045$, CFI = .973, SRMR = .062, RMSEA = .029, 90% CIs = .005 to .043.

Then we constructed a structural model with vitality and behavioral intentions as the dependent variables, competence satisfaction and autonomous motivation as the motivational process variables, and pretask competence perceptions and competence valuation as covariates (Figure 2). In light of previous research showing that competence valuation and perceived competence independently mediate the relationship between feedback and intrinsic motivation (Elliot et al., 2000), we expected competence valuation to predict autonomous motivation but not posttask competence perceptions. Therefore, we drew a direct path from competence valuation to autonomous motivation. To control for individual differences in competence perceptions at the onset of study, we also allowed a direct path from pretask perceived competence to posttask competence satisfaction. The proposed model yield good fit: S-B $\chi^2(321, N = 161) = 360.46$, $p = .064$, CFI = .975, SRMR = .064, RMSEA = .028 with 90% confidence intervals ranging between .000 and .042.

As shown in Figure 2, after controlling for the effect of pretask perceived competence ($\beta = .52$, $p < .01$), the feedback manipulation significantly influenced competence satisfaction ($\beta = .46$). As expected, competence valuation positively predicted autonomous motivation ($\beta = .61$, $p < .01$). Still, competence satisfaction predicted autonomous motivation ($\beta = .28$, $p < .01$), which in turn was positively associated with both subjective vitality ($\beta = .65$, $p < .001$) and intentions to participate in the future ($\beta = .72$, $p < .01$). Last, the indirect effect of the feedback manipulation on autonomous motivation, through competence satisfaction, was significant ($\beta = .13$, $z = 2.80$, $p < .01$). In addition, the indirect effects of feedback on both vitality and intentions to participate, through competence satisfaction and autonomous motivation, were significant ($\beta = .08$, $z = 2.47$, $p < .05$, and $\beta = .09$, $z = 2.73$, $p < .01$, respectively). Collectively, these results suggest that competence satisfaction and autonomous motivation serve as intervening variables in the relationship between manipulated feedback and vitality and intentions to participate in the future.[2]

Ancillary Analyses

To examine the main effects of positive feedback, gender, and competence valuation as well as the interactions between these three variables on competence satisfaction, we performed a hierarchical regression analysis. All three predictors were entered in Step 1 and the three two-way interaction terms (which were created by multiplying the centered means of the respective predictors) were entered in Step 2. The aim of performing moderator analyses was to examine whether the effect of positive feedback would be different for boys, relative to girls, and for individu-

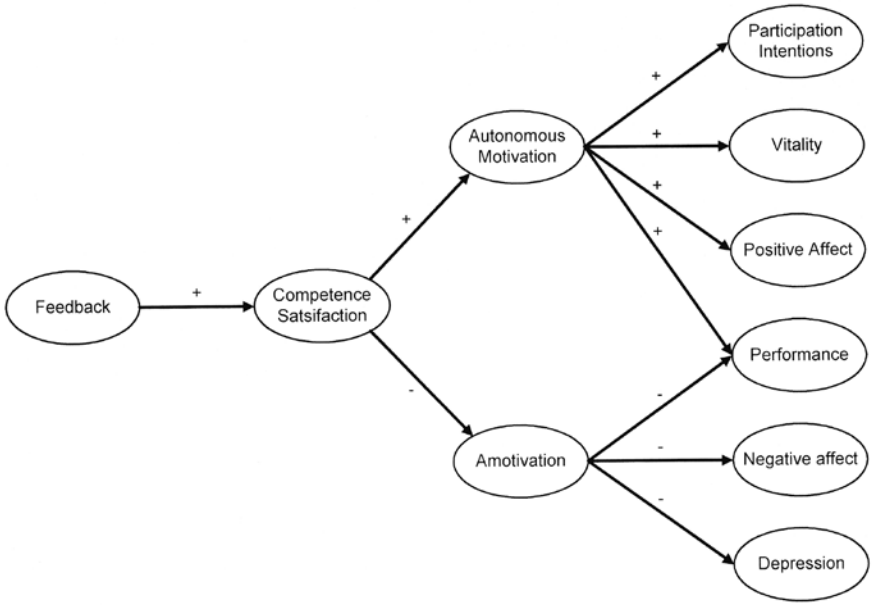

Figure 2 — The structural model with subjective vitality and behavioral intentions to participate as outcomes (Study 1; $N = 228$). All the paths are standardized and statistically significant at the .05 level. Items are not presented for the sake of clarity.

als who value doing well on the activity relative to those who do not value doing well. Results indicated that positive feedback, $\beta = .47$, $p < .01$, and competence valuation, $\beta = .31$, $p < .01$, but not gender yielded a significant positive effect on competence satisfaction. None of the three two-way interactions reached statistical significance.

Brief Discussion

Study 1 investigated whether the experimental manipulation of strong versus mild positive feedback for engaging in shuttle-run activity predicted affect-based (i.e., subjective vitality), attitude-related (i.e., future-time behavioral intentions), and behaviorally related (i.e., performance) outcomes through its effect on competence satisfaction and autonomous motivation. The hypothesized motivational model appeared to fit the data very well, at least for the variables of vitality and intention to participate in the future. The current data provide support for our hypotheses that competence satisfaction and autonomous motivation serve as intervening variables in the relationship between positive feedback and vitality and future-time participation intentions. Interestingly, mild relative to strong positive feedback also predicted competence satisfaction after controlling for preexperimental perceived competence, indicating that manipulated feedback induced a change

in perceived competence over time. Comparison of pre- and posttask means for perceived competence indicated that this change in perceived competence was, in contrast to our expectations, primarily carried by a decrease in perceived competence in the mild positive feedback condition. Apparently, the mild positive feedback did not confirm these participants' expectations for high competence, thereby undermining their competence satisfaction, whereas participants' expectations for high competence were confirmed in the strong positive feedback condition, resulting in a lack of change over time. Thus, it is interesting to note that even mild positive feedback might undermine competence satisfaction if participants' expectations for achieving high competence are high.

Furthermore, follow-up analyses indicated the effect of feedback was not different for boys compared with girls and for individuals attaching high versus low importance to doing well on the exercise activity, suggesting that all individuals—even those who do not find it important to perform well—benefit from receiving strong instead of mild positive feedback. In contrast to the obtained evidence when modeling vitality and intention to participate as outcomes, the results for performance were nonsignificant. Two elements might help to explain this null finding. First, the time interval might have been too short to detect significant effects of strong positive relative to mild positive feedback, as most participants might still have been exhausted after one trial to move on to the next trial. Second, the performance measure assesses a rather light and an effort-based type of performance. Specifically, participants just needed to run as fast as possible, which requires little, if any, concentration or mastering of particular techniques to perform the activity. Study 2 aimed to examine this issue in greater detail by including a more differentiated measure of performance.

Study 2

Study 2 aimed to investigate the generalizability of the proposed motivational model in Study 1 (a) by examining the model in a sport instead of a PE context and (b) by sampling national-level athletes attending specialized sport high schools instead of volunteers. In doing so, we employed a correlational instead of an experimental methodology and we incorporated additional outcome measures. Specifically, in addition to including well-being measures (i.e., vitality and positive affect), we also collected data on ill-being (i.e., negative affect and depression) and asked the coaches of the athletes to provide performance ratings. A more differentiated measure of performance was gathered by asking students' coaches to rate two aspects of athletes' performance: intrapersonal progress over the past year on the physical, tactical, technical, and psychological domains and interpersonal (i.e., normatively assessed) performance. Finally, because optimal motivation yields both high quality of motivation (i.e., autonomous) and high quantity of motivation (i.e., lack of amotivation), we tested in our motivational model whether amotivation would play an additional explanatory role in the relationship between positive feedback and the outcomes.

The inclusion of amotivation as an additional motivational mechanism among athletes seems justified given that previous research has shown that, compared with recreational athletes, competitive athletes tend to report higher levels of amotivation (Fortier, Vallerand, Brière, & Provencher, 1995) and that even some groups of suc-

cessful Olympic-level athletes display high levels of amotivation (Chantal, Guay, Dobreva-Martinova, & Vallerand 1996). Moreover, amotivation has been found to be predictive of especially negative sport-related outcomes, such as athletes' burnout (Cresswell & Eklund, 2005a, 2005b) and dropout from sports (Pelletier, Fortier, Vallerand, & Brière, 2001). Consistent with previous work, we expected that the passive and helpless state that characterizes amotivated athletes would make them especially vulnerable to experience negative affect and depression. In contrast, we expected autonomous motivated athletes to experience positive outcomes such as well-being (Vallerand, 2001). In this regard, we modeled subjective vitality and positive affect as two distinct positive outcomes representing facets of well-being and negative affect and depression as two distinct negative outcomes representing aspects of ill-being. We also predicted that both motivational variables would explain the expected positive effect of coaches' positive feedback on rated performance because athletes who engage voluntarily in their sports are more likely to perform well (Vansteenkiste, Simons, Lens, et al., 2004), whereas athletes who doubt for their abilities are more likely to show performance deficits (Deci & Ryan, 2000).

Method

Participants and Procedures

Permission to conduct the study was granted from the respective school boards of four top sport schools in Belgium (Hasselt, Merksem, Leuven, & Gent). The questionnaire was handed out to approximately 400 top sport students aged between 12 and 20 years. Participation in the study was voluntary and none of the students who were invited to participate refused to do so. The questionnaire was returned by 202 top athletes (response rate = 50%). This sample represented a highly selective group of individuals, as people need to meet very high and competitive standards to matriculate to sport schools. Participants had a mean age of 15.62 years, 8.38 years of experience with their sport (SD = 2.67), and 7.21 years of competition experience (SD = 2.71). In terms of their competition level, 15.9% competed at the international level, 72.6% at the national level, and 11.5% at the provincial level. Participants trained on average 17.93 hr per week (SD = 5.57).

Measures

Perceived Feedback. Four items, scored on a 5-point Likert scale, were used to check students' perceptions of the competence support they regularly received from their coaches (e.g., "My coach regularly provides me positive feedback"). Higher values reflected higher levels of perceptions of competence support feedback received from coaches (α = .83).

Competence Need Satisfaction. We asked participants to indicate the extent to which they felt that they had satisfied their need for competence on a 5-point Likert scale, ranging from 1 (*not at all true*) to 5 (*completely true*). The six items were derived from the recently developed and validated exercise need satisfaction scale (Wilson, Rogers, Rodgers, & Wild, 2006), but they were adjusted to the current sport context. The items focus on the extent to which one feels competent in accom-

plishing a sport activity with respect to the standards of the activity or oneself (e.g., "I'm able to successfully accomplish sport activities that are challenging to me"). Unlike Study 1, in which competence perceptions were measured at the situational level through Intrinsic Motivation Inventory (McAuley et al., 1989), we considered Wilson et al.'s scale as more appropriate for Study 2 because this measure more accurately assesses competence perceptions at the contextual level. Although the anchors and the response format in this study differed from those of the validated version, the internal consistency of the scale was satisfactory ($\alpha = .87$).

Autonomous Motivation and Amotivation. We adapted the Sport Motivation Scale (Pelletier et al., 1995), which is conceptually very similar to the Self-Regulated Questionnaire (SRQ; Ryan & Connell, 1989) that we used in Study 1, to assess autonomous motivation and amotivation. The intrinsic motivation scale (e.g., "Because I enjoy doing sports"; 4 items; $\alpha = .80$), identified regulation scale (e.g., "Because it is important to me"; 4 items; $\alpha = .64$), and amotivation scale (e.g., "It is not clear to me anymore; I don't really think my place is in sport"; 4 items; $\alpha = .87$) were answered on a 5-point Likert scales, ranging from 1 (*completely disagree*) and 5 (*completely agree*). An autonomous motivation scale was created by averaging the intrinsic and identified regulation scores ($\alpha = .81$).

Depression. Depression was measured with the Center for Epidemiological Studies—Depression (CES-D) Scale (Radloff, 1977). Six items were adjusted to the sport context, so they all focused on participants' experience of depressive feelings over the past week at the top sport school (e.g., "During the last week I felt sad at the top sport school"). Ratings were made on a scale ranging from (0) *rarely or none of the time (less than one day),* over (1) *a couple of times (1–2 days),* and *(2) sometimes or regularly (3–4 days),* to *(3) most or all of the time (5–7 days).* Internal consistency was .76.

Subjective Vitality. Vitality assesses the extent to which participants felt alive and energetic at the top sport school over the past few days. Seven items were taken from the General Vitality Scale (Ryan & Frederick, 1997) and were adjusted to the sport context (e.g., "the last couple of days I felt very energetic when doing sports"; 7 items). Items were answered on a 5-point Likert scale varying between 1 (*completely disagree*) and 5 (*completely agree*). Internal consistency in the current sample was .85.

Positive and Negative Affect. Positive and negative affect were measured with the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen 1988). Items were adjusted so that they focused on experienced affect in the top sport school during the past 6 weeks (e.g., "During the past six weeks I felt enthusiastic"; 20 items). Items were answered on a 5-point Likert scale, which varied between 1 (*almost never experienced*) to 5 (*very strongly experienced*). Internal consistency estimates of positive and negative affect were .88 and .89, respectively.

Rated Performance. Belgian top sport students are all closely followed and trained by one single coach, who is likely to have good insight in the progress and performance of the athletes. The coach rated on a 7-point Likert scale ranging from 1 (*strong regression*) to 7 (*strong progression*) the extent to which their athletes had progressed in the (a) technical, (b) tactical, (c) physical, and (d) psychological domain over the past year. These four items were combined to form a measure of

intraindividual athletic performance ($\alpha = .86$). In addition to intraindividual progress, coaches assessed their athletes with normative standards ("How poor or well did your athlete perform relative to the others during the past year?"). The range of this single item to measure interpersonal performance varied between 1 (*very poor compared with others*) and 7 (*very good compared with others*).

Results

Preliminary Analyses

Descriptive statistics including the correlations among the variables are shown in Table 2. Inspection of zero-order correlations in Table 2 shows that perceived positive feedback was positively related to competence satisfaction, autonomous motivation, the two well-being indices (i.e., subjective vitality and positive affect), and the two performance outcomes (i.e., intraindividual and interpersonal), whereas it was negatively related to amotivation and the two ill-being indices (i.e., depression and negative affect). A similar pattern of relations was found for competence need satisfaction. Further, autonomous motivation was positively related to both well-being facets, negatively related to depression, and unrelated to negative affect and performance. Amotivation was negatively related to the two types of well-being and performance, and positively related to ill-being aspects. In addition, components of well-being and ill-being were negatively interrelated, with the former related positively and the latter related negatively to performance.

Primary Analyses

Because not all coaches returned questionnaires pertaining to athletes' performance ($N = 141$), the final sample size in which the motivational model was tested was smaller. Following the same procedures as in Study 1, we began by testing the factor structure of our measures through CFA. All but the PANAS scale yielded acceptable fit indices. Despite the poor fit of the PANAS and instead of dropping misfit items, we opted for using the full scale because the PANAS is considered a well-established instrument.[3]

We proceeded by testing the fit of our measurement model, which included (a) perceived positive feedback as antecedent; (b) competence need satisfaction, autonomous motivation, and amotivation as motivational process variables; and (c) subjective vitality, positive and negative affect, and depression as the affect-based dependent variables, and intraindividual progress and normative based assessment as the performance-based outcomes.

Because of the relative small sample size and to keep the ratio of indicators to the number of cases at a reasonable level, two parcel items were generated for all but normative performance measures and served as indicators for each respective latent variable. Because normative performance was assessed with only one item, the latter served as the single indicator of that variable. Autonomous motivation was defined by the manifest variables of intrinsic motivation and identified regulation.[4] This measurement model including 10 latent factors and 19 indicators yielded acceptable fit indices: S-B $\chi^2(117, N = 139) = 142.89, p = .05$, CFI = .975, SRMR = .038, RMSEA = .040, with 90% confidence intervals ranging between .000 and .061.

Table 2 Descriptive Statistics and Correlations Among the Manifest (Below Diagonal, *N* = 198) and Latent Variables (Above Diagonal, *N* = 141) of Study 2

Variables	Range	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Perceived positive feedback	1–5	3.69	0.65	—	.55***	.35	–.36**	.49***	.46***	–.37***	–.29**	.36**	.40***
2. Competence need satisfaction	1–5	3.83	0.60	.41**	—	.48***	–.35***	.56***	.52***	–.18	–.25**	.22*	.34***
3. Autonomous motivation	1–5	4.32	0.47	.24**	.40**	—	–.56***	.47***	.43**	–.12	–.20	.13	.12
4. Amotivation	1–5	1.84	0.88	–.32**	–.33**	–.50**	—	–.53***	–.38**	.38***	.56**	–.37**	–.37**
5. Subjective vitality	1–5	3.63	0.65	.44**	.52**	.43**	–.48**	—	.71***	–.32**	–.27	.27	.39***
6. Positive affect	1–5	3.50	0.64	.42**	.45**	.40**	–.34**	.67**	—	–.32**	–.27	.24	.32**
7. Negative affect	1–5	2.10	0.76	–.33**	–.15*	–.10	.34**	–.30**	–.28**	—	.49*	–.22**	–.18*
8. Depression	0–3	0.40	0.41	–.23**	–.22**	–.16*	.41**	–.29**	–.23**	.40**	—	–.30***	–.29**
9. Intraindividual progress†	1–7	5.06	0.83	.28**	.20*	.10	–.29**	.25**	.21*	–.18*	–.24**	—	.80***
10. Interindividual performance†	1–7	4.56	1.41	.36**	.32**	.11	–.33**	.36**	.30**	–.17*	–.24**	.74**	—

***$p < .001$, *$p < .05$, **$p < .01$.

†$N = 141$.

Next we built the structural model in which we hypothesized that positive feedback would (a) positively predict subjective vitality and positive affect, through autonomous motivation, (b) negatively predict negative affect and depression through amotivation, (c) positively predict intraindividual progress and normative based performance through autonomous motivation and negatively through amotivation, and that (d) competence satisfaction would mediate the relation between positive feedback and both motivational variables. Although not far from earlier conventions, which suggested that fit indices above >.90 were indicative of adequate fit, this initial model yielded a questionable fit to the data, S-B $\chi^2(185) = 262.73$, $p < .01$, CFI = .932, SRMR = .102, RMSEA = .055, 90% CI = .039 to .070). Taking into account the post hoc suggestions of the Lagrange multiplier test, and based on SDT assumption that (a) satisfaction of the need for competence facilitates positive outcomes (Deci & Ryan, 2000), such as subjective vitality (Reinboth et al., 2004) and well-being (Levesque et al., 2004), and (b) a spurious link between feedback and performance (see Pelletier & Vallerand, 1996), we added a direct path from competence need satisfaction to subjective vitality and positive affect and from feedback to the two performance variables.

The revised structural model provided acceptable fit indices, S-B $\chi^2(145) = 184.14$, $p = .02$, CFI = .963, SRMR = .083, RMSEA = .044, 90% CIs = .020 to .062. This model is graphically displayed in Figure 3. In support of our hypotheses, positive feedback positively predicted competence need satisfaction ($\beta = .57$, $p < .01$), which in turn predicted autonomous motivation ($\beta = .49$, $p < .01$) and amotivation ($\beta = -.38$, $p < .01$). Autonomous motivation predicted subjective vitality ($\beta = .31$, $p < .01$) and positive affect ($\beta = .25$, $p < .05$), whereas amotivation emerged as a positive predictor of negative affect ($\beta = .38$, $p < .01$) and depression ($\beta = .56$, $p < .01$) and yielded a negative relation to intraindividual progress ($\beta = -.28$, $p < .01$) and interindividual performance ($\beta = -.26$, $p < .01$). Autonomous motivation was unrelated to both performance measures. In addition, perceptions of feedback were found to directly predict intraindividual progress ($\beta = .26$, $p < .01$) and normative-based performance ($\beta = .32$, $p < .01$), whereas competence need satisfaction was found to directly predict both subjective vitality ($\beta = .43$, $p < .01$) and positive affect ($\beta = .42$, $p < .01$). Inspection of indirect effects suggested the presence of an indirect effect between coach feedback and autonomous motivation ($\beta = .28$, $z = 3.06$, $p < .01$) and amotivation ($\beta = -.22$, $z = -2.92$, $p < .01$), indicating that the effect of coach feedback on both aspects of motivation could be accounted for by competence need satisfaction. Furthermore, there was also an indirect effect of coach feedback on subjective vitality ($\beta = .33$, $z = 4.03$, $p < .01$), positive affect ($\beta = .31$ $z = 4.21$, $p < .01$), negative affect ($\beta = -.08$, $z = -2.46$, $p < .05$), and depression ($\beta = -.12$, $z = -2.34$, $p < .05$), suggesting that competence need satisfaction, autonomous motivation, and amotivation could account for part of the direct effect of coach feedback on aspect of well-being, ill-being.[5]

Ancillary Analyses

In an ancillary set of analyses, we examined the effect of gender and the interaction between gender and coach feedback. As in Study 1, we proceeded by performing a series of hierarchical regression analyses in which gender and positive feedback were entered in Step 1 and the interaction between both variables, which was

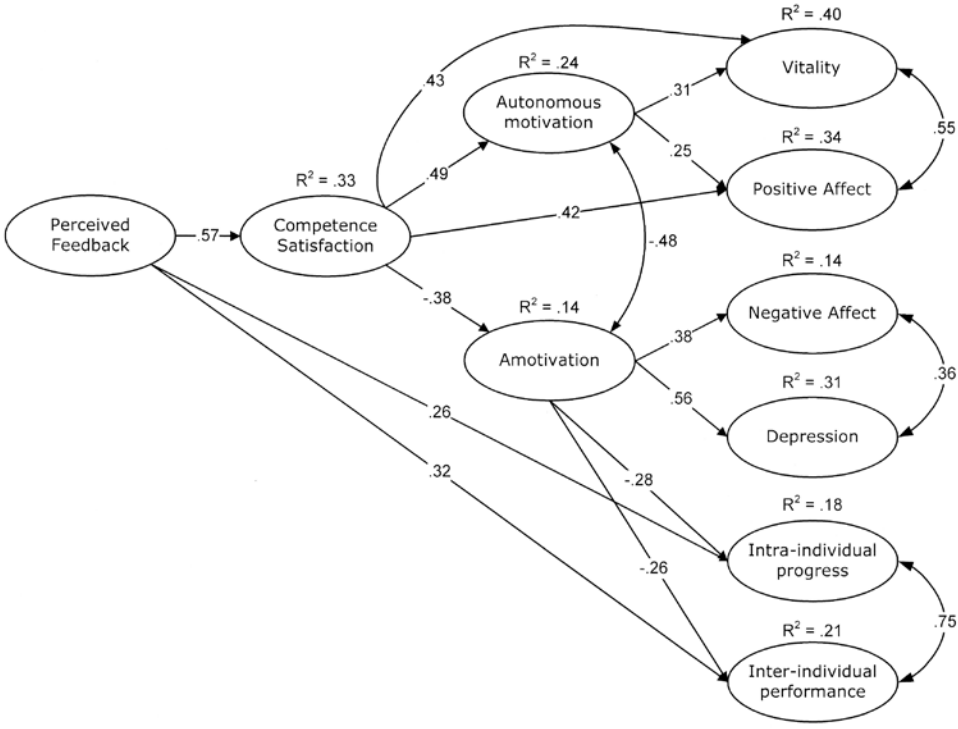

Figure 3 — The structural model with well-being, ill-being, and rated performance as outcomes (Study 2; $N = 139$). All the paths are standardized and statistically significant at the .05 level. Parcel items are not presented for the sake of clarity.

created by multiplying centered means, was entered in Step 2. Gender did not yield any effect on the outcomes, whereas positive feedback positively predicted all outcomes. Gender and positive feedback interacted in the prediction of positive affect, $\beta = -.22, p < .05$, indicating that the beneficial effect of positive feedback on positive affect was less strong, $\beta = .30, p < .05$, for males compared with females, $\beta = .60, p < .01$. These findings are in line with those of Nicaise et al. (2006), who found that females reported higher levels of adaptive response patterns than did males as a response to PE teachers' feedback. None of the other interaction effects was significant.

Brief Discussion

Similar to Study 1, Study 2, in which coach feedback was subjectively assessed, we found perceived positive feedback to positively predict subjective vitality and positive affect through its effect on competence need satisfaction and autonomous

motivation. Different from Study 1, there was a direct path left from competence need satisfaction to both well-being indices. Furthermore, amotivation, which as a mediational mechanism within the sport context has been relatively understudied, at least among adolescent top sport athletes (for older athletes, see Cresswell & Eklund, 2005a, 2005b), appeared to account for the observed effect of positive feedback on depression and negative affect. Finally, amotivation was found to play an explanatory role in the relationship between coach feedback and performance, whereas, contrary to our expectations, autonomous motivation was not. In short, autonomous motivation and amotivation were found to play a uniquely explanatory role toward aspects of well-being and ill-being and performance, respectively.

General Discussion

In two studies, we investigated from the SDT perspective the motivational role of positive competence feedback in PE and sport contexts. Mainly, we examined a motivational model in which autonomous motivation, as an index of quality of motivation, and amotivation, as an index of quantity of motivation, would account for the expected beneficial effect of positive feedback on affective (i.e., well-being, ill-being) and behavior-related outcomes (i.e., intention to participate in the future and performance). In general, the proposed motivational model was supported using different methodologies (i.e., experimental and correlational), domains (i.e., PE and sports), levels of generality (i.e., situational and domain specific), and population samples (i.e., volunteers and athletes).

In line with SDT, previous laboratory and sport- or exercise-related studies have shown that the provision of positive feedback enhances intrinsic motivation through satisfying the basic need for competence (e.g., Vallerand & Reid, 1984). Our results extend previous work as they show that competence satisfaction not only can account for the effect of feedback on autonomous motivation (Studies 1 and 2), which includes intrinsic motivation as one of its subcomponents, but it can also account for the negative effect of positive feedback on amotivation (Study 2). Hence, when praised by PE teachers and sport coaches for successfully accomplishing a required activity, pupils tend to feel competent, leading them to engage in the activity in a more volitional and autonomous fashion and preventing them from feeling helpless and demotivated.

A more volitional and autonomous motivation was found in Study 1 to yield various beneficial effects, such as a stronger sense of experienced vitality and vigor after finishing a shuttle-run task and a greater intention to partake in similar activities in the future. These findings are remarkable for three reasons. First, the study was ecologically valid because the experiment took place in a real-life setting (i.e., a schoolyard), because we used an ordinary task often employed in PE classes, and because the difference in administered competence feedback between the strong and mild feedback condition was subtle (Prentice & Miller, 1992). We implemented a mild positive (rather than negative) feedback condition as we assumed that PE teachers are less likely to provide strong negative feedback to their pupils in PE classes. Second, the proposed motivational model was found to hold after controlling for individuals' initial levels of pretask competence perceptions and valuing of the task. Inspection of pre- and posttask competence means indicated, however, that the observed effect of the feedback manipulation

was primarily carried by the undermining effect of mild positive feedback on competence satisfaction, presumably because participants had high expectations for success, which were not confirmed. In this regard, the mild positive feedback was probably perceived as rather negative and hence competence thwarting. In contrast, providing strong positive feedback to participants only seemed to confirm (rather than further increase) their already relatively high competence perceptions. This indicates that even informing students that they were just average achievers might undermine their need for competence and, hence, be less facilitative of their autonomous motivation, experienced vigor, and future-time behavioral intentions. Third, feedback was found to be equally motivating for those who valued doing well on the administered task compared with those who did not value doing well. So it seems that even pupils who care about their performance on the shuttle-run task were affected by the mild versus strong positive feedback as much as those who did not care about their performance. These findings are in line with SDT, which suggests that the failure to fully satisfy the basic need for competence lowers the quality of motivation, even for individuals who do not explicitly or consciously desire to do well on a particular activity

On the other hand, positive feedback did not directly affect performance in Study 1. The finding that feedback has an effect on autonomous motivation and through this on future intentions and affect-based outcomes but not directly on performance is consistent with some previous studies (Bindarwish & Tenenbaum, 2006; Gernigon & Delloye, 2003). The findings are also in line with Brophy's (1999) contention that motivation should not be treated as analogous to performance, and that optimal motivation does not ensure maximal performance (especially in the short run). Alternatively, one might suspect that the nature of task and subsequently the type of performance that was assessed in Study 1 may explain the null findings of autonomous motivation. Previous research has shown that favorable conditions such as autonomy-supportive contexts enhance performance (Vansteenkiste, Simons, Lens, et al., 2004; Study 3), especially if qualitative aspects of performance are assessed. However, the task employed in Study 1 required high physical effort so that the performance measure might rather represent a measure of quantity rather than quality of performance. Furthermore, given the short intervals among the trials, it is likely that feedback could not have had an immediate effect on performance. Perhaps any enhancement in performance as long as it goes through the activation of adaptive mechanisms such as autonomous motivation will become more apparent in the long run and especially for tasks requiring cognitive load and focused attention.

Similar beneficial effects of positive feedback were found in Study 2, in which outcomes were not assessed with respect to a specific activity, but at the domain level, that is, with respect to one's experiences at a top sport school (Vallerand, 2001). Indeed, positive feedback was found to positively predict athletes' experienced well-being through its effect on competence need satisfaction and autonomous motivation. Furthermore, amotivation was found to account for the negative relation between perceived positive coach feedback and ill-being. Thus, whereas experiencing choice and volition when engaging in sport seems to provide one with a sense of vigor, enthusiasm, and positive affect, feeling helpless seems to predict negative outcomes, such as depressive feelings and negative affect. Similar findings are reported by Standage and colleagues (2005), who found amotivation, emanating

from thwarting the satisfaction of basic psychological needs, to be associated with negative affect, and from Cresswell and Eklund (2005b), who found amotivation to be linked with athletes' burnout. These results are supportive of Vallerand's (2001) suggestion that there is a symmetrical relation between the predictors and criterion variables, so that positive predictors (i.e., autonomous motivation) are related to beneficial outcomes, whereas negative predictors (i.e., amotivation) are linked with harmful outcomes.

The explanatory role of amotivation in the relation between perceived feedback and performance forms, however, an exception to this pattern of results. These findings nevertheless seem in line with the recent research by Legault and associates (2006), who reported that academic performance was negatively predicted by two out of the four examined subcomponents of their amotivation construct, that is, ability and effort beliefs, but not task value and task characteristics. Given that the amotivation component of low-ability beliefs in their study primarily reflects the lack of perceived competence, the current results concerning the effect of amotivation on performance seem in line with the work by Legault et al. (2006).

Furthermore, the null effect of autonomous motivation on performance in Study 2 was not expected. Although we had used a more differentiated measure of performance in Study 2 compared with Study 1 to examine whether autonomous motivation would possibly be related to different aspects of performance (i.e., intrapersonal progress vs. interpersonal performance), no unique effects of autonomous motivation on these two aspects of performance were observed after controlling for the effects of amotivation. It would be instructive in future research to gain more insight into the way coaches rate athletes' performance. Are they especially attentive to quantitative aspects, such as the amount of time and energy their athletes have put in improving their technique or physical condition, or do they also take into account qualitative aspects of performance, such as the effective mastering of new techniques? Such information might help to gain insight into the currently used ratings of performance and perhaps also in the pattern of findings of Study 2.

One last finding deserves further attention. Different from Study 1, in Study 2 there was still a direct effect of feedback on performance that could not be accounted for by motivational variables. Why might this difference between the two studies occur? A likely explanation is that in Study 1 feedback was administered in a rather objective way and it contained, mainly, competence-related statements. Therefore feedback had a direct effect on competence satisfaction. In contrast, feedback in Study 2 referred to *perceptions* of feedback instead of actual feedback. It is likely that the strength of the relationship between perceived positive feedback and good performance is not only unidirectional but also circular: Athletes who are performing well at the top sport school are more likely to elicit positive feedback from their coaches, This might further increase the association between perceived feedback and performance and might help to explain why competence satisfaction cannot fully account for the effect of feedback on performance. In addition to this argument of bidirectionality, the direct positive effects of positive feedback on performance might also be accounted for by the behavioral confirmation mechanism (Pelletier & Vallerand, 1996). Specifically, top sport athletes might try to live up to, that is, to behaviorally confirm, the high expectations of their encouraging coaches. These high expectations for performance can function as self-fulfilling prophecies, so

that athletes of verbally rewarding coaches come to realize the expectations of their coaches. Future research might want to empirically address this behavioral confirmation mechanism.

Limitations

Although the two studies evidenced consistent results, a few limitations should be noted. First, despite the rigorous analytical techniques, much of the data are correlational in nature and therefore no firm causal relations can be inferred. For example, although competing models failed to fit the data as well in Study 2, it might be still possible that aspects of well-being influence autonomous motivation instead of vice versa or there might be a circular process in which autonomous motivation and well-being yield a reciprocal effect over time. Longitudinal studies along with experimental ones are needed to examine these issues in greater depth. Second, although the effect of manipulated positive feedback was found to be independent of the degree to which one values doing well on the exercise activity in Study 1, it would be important to replicate this finding in the sport context. Certainly, in light of the large effect of competence valuation on autonomous motivation in Study 1, it is a serious limitation that competence valuation was not included also in Study 2. Third, the post hoc inclusion of paths from feedback to performance and from competence need satisfaction to subjective vitality and positive affect in Study 2 might capitalize on chance or some unobserved characteristics of the present sample. We provided some explanations for these unexpected findings, but future studies might need to confirm or refute our claims. Finally, competence support was operationalized in a rather restricted manner as it only involved the manipulation (Study 1) or assessment (Study 2) of positive feedback. However, competence support yields more than only the provision of positive feedback, as it also includes the provision of help in case of problems and the communication of clear expectations and guidelines (Reeve, 2002; Sierens, Vansteenkiste, Soenens, & Goossens, in press). Certainly, the sport and PE field will be informed and enriched by future correlation and experimental studies that will examine more thoroughly some of the aspects of feedback (e.g., credibility and trustworthiness of the feedback provider), as suggested by Henderlong and Lepper (2002) and Bandura (1977).

In conclusion, it seems that feedback satisfying the need for competence fosters autonomous motivation that in turn positively predicts positive affect and intentions to participate in future-time activities. Concurrently, feedback that fails to meet individuals' need for competence can evoke amotivation, which in turn predicts negative affect-based outcomes and poor performance.

Acknowledgment

We are very grateful to Wouter Goris for his help in collecting the data for Study 2.

Notes

1. Although different terms have been used to label the concept of positive feedback, such as *praise* (Henderlong & Lepper, 2002) and *verbal rewards* (Deci, Koestner, & Ryan, 1999), we preferred to use the term *positive feedback* in the current contribution.

2. We tested several alternative models in addition to our proposed motivational model. First, we tested an alternative four-step model in which feedback would predict autonomous motivation, which, in turn, would predict vitality and behavioral intentions through fostering a sense of competence. This model evidenced worse fit, and the examination of the difference in the AIC favored our suggested model as more parsimonious (ΔAIC = 87.91). Second, we examined a three-step model in which feedback would concurrently affect autonomous motivation, vitality, and behavioral intentions through the mediation of competence satisfaction. This model also showed worse fit and parsimony (ΔAIC = 53.63).

3. Subsequent testing of the structural model with the use of either the full PANAS scale or the revised one that showed acceptable fit indices during CFA evidenced no significant differences.

4. To identify all the two-indicator latent factors, additional constraints between the error variances of the indicators were imposed.

5. Similar to Study 1, we tested two alternative models. First, we examined an alternative four-step model in which positive feedback would predict autonomous motivation and amotivation, which in turn would predict the dependent variables through the mediating effects of competence satisfaction. After dropping nonsignificant paths, this model turned out to be less parsimonious (ΔAIC = 12.99). Second, we tested a three-step model in which the effect of positive feedback on autonomous motivation, amotivation and all outcomes would be fully mediated by competence need satisfaction. This model appeared to be, statistically, slightly less parsimonious (ΔAIC = 2.67) than our proposed motivational model, but is theoretically less well grounded, as according to SDT (Deci & Ryan, 2000), self-regulated forms of motivation are said to precede the outcomes (e.g., well-being, performance).

References

Allen, J.B., & Howe, B.L. (1998). Player ability, coach feedback, and female adolescent athletes' perceived competence and satisfaction. *Journal of Sport & Exercise Psychology, 20,* 280–299.

Amorose, A.J., & Horn, T.S. (2000). Intrinsic motivation: Relationships with collegiate athletes' gender, scholarship status, and perceptions of their coaches' behavior. *Journal of Sport & Exercise Psychology, 22,* 63–84.

Anderson, R., Manoogian, S.T., & Reznick, J.S. (1976). The undermining and enhancing of intrinsic motivation in preschool children. *Journal of Personality and Social Psychology, 34,* 915–922.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84,* 191–215.

Biddle, S.J.H., Sallis, J., & Cavill, N. (Eds.) (1998). *Young and active? Young people and health enhancing physical activity: Evidence and implications*. London: Health Education Authority.

Bindarwish, J., & Tenenbaum, G. (2006). Metamotivational and contextual effects on performance, self-efficacy, and shifts in affective states. *Psychology of Sport and Exercise, 7,* 41–56.

Brophy, J. (1999). Research on motivation in education: Past, present, and future. In T. Urdan (Ed.), *Advances in Motivation and achievement: The Role of Context* (Vol. 11, pp. 1–44). Greenwich, CT: JAI press.

Butler, R. (1987). Task-involving and ego-involving properties of evaluation: Effects of different feedback conditions on motivational perceptions, interest, and performance. *Journal of Educational Psychology, 79,* 474–482.

Byrne, B.M. (1994). *Structural equation modeling with EQS and EQS/Windows: Basic concepts, applications, and programming*. Thousand Oaks, CA: Sage.

Chantal, Y., Guay, F., Dobreva-Martinova, T., & Vallerand, R.J. (1996). Motivation and elite performance: An exploratory investigation with Bulgarian athletes. *International Journal of Sport Psychology, 27,* 173–182.

Chelladurai, P., & Saleh, S.D. (1980). Dimensions of leader behavior in sports: Development of a leadership scale. *Journal of Sport Psychology, 2,* 34–45.

Cresswell, S.L., & Eklund, R.C. (2005a). Motivation and burnout among top amateur rugby players. *Medicine and Science in Sports and Exercise, 37,* 469–477.

Cresswell, S.L., & Eklund, R.C. (2005b). Changes in athlete burnout and motivation over a 12-week league tournament. *Medicine and Science in Sports and Exercise, 37,* 1957–1966.

Deci, E.L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology, 18,* 105–115.

Deci, E.L. (1972). Intrinsic motivation, extrinsic reinforcement, and inequity. *Journal of Personality and Social Psychology, 22,* 113–120.

Deci, E.L., Cascio, W.F., & Krusell, J. (1975). Cognitive evaluation theory and some comments on the Calder and Staw critique. *Journal of Personality and Social Psychology, 31,* 81–85.

Deci, E.L., Koestner, R., & Ryan, R.M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125,* 627–668.

Deci, E.L., & Ryan, R.M. (2000). The "What" and "Why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11,* 227–268.

Edmunds, J., Ntoumanis, N., & Duda, J.L. (2006). A test of self-determination theory in the exercise domain. *Journal of Applied Social Psychology, 36,* 2240–2265.

Elliot, A.J., Faler, J., McGregor, H.A., Campbell, W.K., Sedikides, C., & Harackiewicz, J.M. (2000). Competence valuation as a strategic intrinsic motivation process. *Personality and Social Psychology Bulletin, 26,* 780–794.

Elliot, A.J., & Harackiewicz, J.M. (1996). Approach and avoidance achievement goals and intrinsic motivation: A mediational analysis. *Journal of Personality and Social Psychology, 70,* 461–475.

Escarti, A., & Guzman, J.F. (1999). Effects of feedback on self-efficacy, performance, and choice in an athletic task. *Journal of Applied Sport Psychology, 11,* 83–96.

Fortier, M.S., Vallerand, R.J., Brière, N.M., & Provencher, P.J. (1995). Competitive and recreational sport structures and gender: A test of their relationship with sport motivation. *International Journal of Sport Psychology, 26,* 24–39.

Gernigon, C., & Delloye, J.B. (2003). Self-efficacy, causal attribution, and track athletic performance following unexpected success or failure among elite sprinters. *The Sport Psychologist, 17,* 55–76.

Gernigon, C., Fleurance, P., & Reine, B. (2000). Effects of uncontrollability and failure on the development of learned helplessness in perceptual-motor tasks. *Research Quarterly for Exercise and Sport, 71,* 44–54.

Grouzet, F.M.E., Vallerand, R.J., Thill, E.E., & Provencher, P.J. (2004). From environmental factors to outcomes: A test of an integrated motivational sequence. *Motivation and Emotion, 28,* 331–346.

Harackiewicz, J.M. (1979). The effects of reward contingency and performance feedback on intrinsic motivation. *Journal of Personality and Social Psychology, 37,* 1352–1361.
Harackiewicz, J.M., Manderlink, G., & Sansone, C. (1984). Rewarding pinball wizardry: Effects of evaluation and cue value on intrinsic interest. *Journal of Personality and Social Psychology, 47,* 287–300.
Henderlong, J., & Lepper, M.R. (2002). The effects of praise on children's intrinsic motivation: A review and synthesis. *Psychological Bulletin, 128,* 774–795.
Hu, L., & Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6,* 1–55.
Jussim, L., Soffin, S., Brown, R., Ley, J., & Kohlhepp, K. (1992). Understanding reactions to feedback by integrating ideas from symbolic interactionism and cognitive evaluation theory. *Journal of Personality and Social Psychology, 62,* 402–421.
Kast, A., & Connor, K. (1988). Sex and age differences in response to informational and controlling feedback. *Personality and Social Psychology Bulletin, 14,* 514–523.
Kline, R.B. (2005). *Principles and Practice of Structural Equation Modeling* (2nd ed.). New York: Guilford Press.
Koka, A., & Hein, V. (2003). Perceptions of teacher's feedback and learning environment as predictors of intrinsic motivation in physical education. *Psychology of Sport and Exercise, 4,* 333–346.
Legault, L., Green-Demers, I., & Pelletier, L. (2006). Why do high school students lack motivation in the classroom? Toward an understanding of academic amotivation and the role of social support. *Journal of Educational Psychology, 98,* 567–582.
Levesque, C., Zuehlke, A.N., Stanek, L.R., & Ryan, R.M. (2004). Autonomy and competence in German and American university students: A comparative study based on self-determination theory. *Journal of Educational Psychology, 96,* 68–84.
Magill, R.A. (1998). *Motor learning: Concepts and applications* (5th ed.). Boston, MA: McGraw Hill.
Marsh, H.W., Hau, K., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling, 11,* 320–341.
McAuley, E., Duncan, T., & Tammen, V.V. (1989). Psychometric properties of the Intrinsic Motivation Inventory in a competitive sport setting: A confirmatory factor analysis. *Research Quarterly for Exercise and Sport, 60,* 48–58.
Nicaise, V., Cogérino, G., Bois, J., & Amorose, A. (2006). Students' perceptions of teacher feedback and physical competence in physical education classes: Gender effects. *Journal of Teaching in Physical Education, 25,* 36–57.
Pelletier, L.G., Fortier, M., Vallerand, R.J., & Brière, N.M. (2001). Associations among perceived autonomy support, forms of self-regulation, and persistence: A prospective study. *Motivation and Emotion, 25,* 279–306.
Pelletier, L.G., Fortier, M.S., Vallerand, R.J., Tuson, K.M., Brière, N.M., & Blais, M.R. (1995). Toward a new measure of intrinsic motivation, extrinsic motivation, and amotivation in sports: The sport motivation scale (SMS). *Journal of Sport & Exercise Psychology, 17,* 35–53.
Pelletier, L.G., & Vallerand, R.J. (1996). Supervisors' beliefs and subordinates' intrinsic motivation: A behavioral confirmation analysis. *Journal of Personality and Social Psychology, 71,* 331–340.
Pittman, T.S., Davey, M.E., Alafat, K.A., Wetherill, K.V., & Kramer, N.A. (1980). Informational versus controlling verbal rewards. *Personality and Social Psychology Bulletin, 6,* 228–233.
Prentice, D.A., & Miller, D.T. (1992). When small effects are impressive. *Psychological Bulletin, 112,* 160–164.
Price, M.S., & Weiss, M.R. (2000). Relationships among coach burnout, coach behaviors, and athletes' psychological responses. *The Sport Psychologist, 14,* 391–409.

Radloff, L.S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1,* 385–401.

Reeve, J. (2002). Self-determination theory applied to educational settings. In E.L. Deci & R.M. Ryan (Eds.), *Handbook of self-determination research* (pp. 183–203). Rochester, NY: University of Rochester Press.

Reeve, J., & Deci, E.L. (1996). Elements of the competitive situation that affect intrinsic motivation. *Personality and Social Psychology Bulletin, 22,* 24–33.

Reinboth, M., Duda, J.L., & Ntoumanis, N. (2004). Dimensions of coaching behavior, need satisfaction, and the psychological and physical welfare of young athletes. *Motivation and Emotion, 28,* 297–313.

Ryan, R.M. (1982). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory. *Journal of Personality and Social Psychology, 43,* 450–461.

Ryan, R.M., & Connell, J.P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57,* 749–761.

Ryan, R.M., & Frederick, C. (1997). On energy, personality, and health: Subjective vitality as a dynamic reflection of well-being. *Journal of Personality, 65,* 529–565.

Sansone, C. (1989). Competence feedback, task feedback, and intrinsic interest: An examination of process and context. *Journal of Experimental Social Psychology, 25,* 343–361.

Schunk, D.H. (1995). Self-efficacy, motivation, and performance. *Journal of Applied Sport Psychology, 7,* 112–137.

Sierens, E., Vansteenkiste, M., Goossens, L., Soenens, B., & Dochy, F. (in press). The interactive effect of perceived teacher autonomy-support and structure in the prediction of self-regulated learning. *British Journal of Educational Psychology*.

Standage, M., Duda, J.L., & Ntoumanis, N. (2005). A test of self-determination theory in school physical education. *British Journal of Educational Psychology, 75,* 411–433.

Vallerand, R.J. (2001). A Hierarchical Model of Intrinsic and Extrinsic Motivation in sport and exercise. In G.C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 263–319). Champaign, IL: Human Kinetics.

Vallerand, R.J., & Reid, G. (1984). On the causal effects of perceived competence on intrinsic motivation: A test of cognitive evaluation theory. *Journal of Sport Psychology, 6,* 94–102.

Vansteenkiste, M., Lens, W., & Deci, E.L. (2006). Intrinsic versus extrinsic goal contents in self-determination theory: Another look at the quality of academic motivation. *Educational Psychologist, 41,* 19–31.

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K.M., & Deci, E.L. (2004). Motivating learning, performance, and persistence: The synergistic effects of intrinsic goal contents and autonomy-supportive contexts. *Journal of Personality and Social Psychology, 87,* 246–260.

Vansteenkiste, M., Simons, J., Soenens, B., & Lens, W. (2004). How to become a persevering exerciser? Providing a clear, future intrinsic goal in an autonomy-supportive way. *Journal of Sport & Exercise Psychology, 26,* 232–249.

Watson, D., Clark, L.A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54,* 1063–1070.

Weinberg, R.S., & Jackson, A. (1979). Competition and extrinsic rewards: Effect on intrinsic motivation and attribution. *Research Quarterly, 50,* 494–502.

Weinberg, R.S., & Ragan, J. (1979). Effects of competition, success/failure, and sex on intrinsic motivation. *Research Quarterly, 50,* 503–510.

Whitehead, J.R., & Corbin, C.B. (1991). Youth fitness testing: The effect of percentile-based evaluative feedback on intrinsic motivation. *Research Quarterly for Exercise and Sport, 62,* 225–231.

Wilson, P.M., Rogers, W.T., Rodgers, W.M., & Wild, T.C. (2006). The psychological need satisfaction in exercise scale. *Journal of Sport & Exercise Psychology, 28,* 231–251.

Woodcock, A.J., & Corbin, C.B. (1992). The effects of verbal feedback on intrinsic motivation and perceived competence of cricketers. *Australian Journal of Science and Medicine in Sport, 24,* 94–99.