

How does knowledge about the criteria for an upcoming test relate to adolescents' situational motivation in physical education? A self-determination theory approach

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Abstract

Students' knowledge about the criteria for an upcoming test is a crucial component of assessment quality. Grounded in self-determination theory, we investigated whether knowledge about the criteria for an upcoming test related to students' situational motivation and experienced anxiety during physical education (PE). We also examined whether these relations were: (a) mediated by need-based experiences; and (b) moderated by teachers' motivating style. Participants were 659 students (55.54% boys, 44.46% girls, mean age 14.72 years, standard deviation = 0.94) out of 40 classes from 32 schools taught by 39 different PE teachers. Analyses through multilevel structural equation modeling

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showed that students with more knowledge about the criteria for an upcoming test valued and enjoyed the lesson more (i.e. autonomous motivation), and felt less aloof (i.e. amotivation). Relations between knowledge about the criteria and students' situational motivation were mediated by experienced need satisfaction. Specifically, students who had more knowledge about the criteria for an upcoming test felt more in charge of their learning process (i.e. autonomy satisfaction), felt more effective in reaching their goals (i.e. competence satisfaction) and felt more connected to the teacher (i.e. relatedness satisfaction). Although relations between knowledge about the criteria and students' motivation were not moderated by teachers' motivating style, teachers' motivating style displayed independent relations with students' motivation. Implications for assessment quality and students' motivation in PE are discussed.

Keywords

Assessment, motivation, autonomy, students, self-determination theory

Introduction

Assessment is a challenging part of physical education (PE) teachers' pedagogy (Hay and Penney, 2013; López-Pastor et al., 2013). Being assessed in PE may come with a motivational cost and may raise feelings of pressure and anxiety among students (e.g. Krijgsman et al., 2017). Increasing students' knowledge about the assessment criteria has been identified as a crucial component of assessment quality (Borghouts et al., 2017; Hay and Macdonald, 2008). Yet, no research to date empirically examined whether knowledge about the assessment criteria may foster students' motivation and reduce anxiety. In the current study, we rely on self-determination theory (SDT) (Ryan and Deci, 2017) to address this gap in the current literature.

SDT distinguishes qualitatively different forms of motivation. A distinction is made between autonomous or more volitional forms of motivation, controlled or more pressured forms of motivation, and amotivation or a lack of motivation. According to SDT, students are more likely to be autonomously motivated, and less likely to display controlled motivation or amotivation, when their basic psychological needs for autonomy (i.e. experiencing freedom and self-endorsement), competence (i.e. feeling effective), and relatedness (i.e. experiencing mutual trust and care) are met (Deci and Ryan, 2000; Ryan and Deci, 2017). The purposes of this study are to investigate if knowledge about the criteria for an upcoming test relates to students' motivation (i.e. autonomous, controlled, amotivation) and experienced anxiety (Research Question 1), and whether experienced need satisfaction mediates this relation (Research Question 2). Moreover, because teachers' motivating style is likely to exert a major influence on students' need-based experiences and their motivation (e.g. Haerens et al., 2015), we also examine whether teachers' motivating style reinforces or attenuates the relation between knowledge about the assessment for an upcoming test and students' motivation or experienced anxiety (Research Question 3). We address these questions from a situational perspective (i.e. in relation to a specific PE lesson), as recent work revealed that the teaching strategies teachers rely on (Mainhard et al., 2011) as well as students' need-based functioning (Van der Kaap-Deeder et al., 2017) can substantially vary from lesson to lesson (Tsai et al., 2008).

Assessment criteria in PE

Strong calls for increased assessment transparency apply to all educational contexts (Stiggins et al., 2007), including PE (Hay and Penney, 2013). These claims stem from both a summative (Stiggins

et al., 2007) and a formative perspective (Hattie and Timperley, 2007). From a summative or product-oriented perspective, clear and unambiguous assessment criteria guarantee validity and consistency of teachers' assessments and ensure that teachers can accurately assess and justify students' achievements (Desrosiers et al., 1997). From a formative or process-oriented perspective, students need to know and understand the assessment criteria so that they can accumulate and interpret evidence to recognize their learning progress, to select future goals, and to be able to determine the best strategies to attain these goals (Hattie and Timperley, 2007; Hay and Penney, 2013). Knowledge about the assessment criteria thus constitutes a necessary precondition that helps students to better monitor and regulate their own learning (Hattie and Timperley, 2007). Yet, PE teachers often assess students' performances based on their own tacit professional expertise (Annerstedt and Larsson, 2010; Hay and Macdonald, 2008; Svennberg et al., 2014), and in these cases what teachers base their judgement on may be a mystery for students (Borghouts et al., 2017; Redelius and Hay, 2012).

Students' motivation and need-based experiences according to SDT

Knowing the criteria for an upcoming test may impact students' motivation. According to SDT (Deci and Ryan, 2000), students display autonomous motivation when they find their PE class to be enjoyable and interesting (i.e. intrinsic motivation) or value its benefits (i.e. identified regulation). Students have controlled motivation when they put effort into the lesson to please their teacher, to obtain good grades, or to avoid criticism (i.e. external regulation), or when they pressure themselves to do well (i.e. introjected regulation) – for instance by buttressing their activity engagement out of feelings of guilt and contingent self-worth. While students are – quantitatively speaking – motivated when they display either autonomous or controlled motivation, amotivation reflects a lack of motivation. Specifically, amotivated students typically invest a minimum of effort in PE classes because they lack competence to perform the activities, or because they ascribe no value to the activities (Deci and Ryan, 2000). Many studies indicated that autonomous motivation, relative to controlled motivation and amotivation, is associated with a host of desirable outcomes (Van den Berghe et al., 2014) such as students' physical activity levels in (Aelterman et al., 2012) and outside PE (Hagger et al., 2009). On the other hand, controlled motivation and amotivation relate to undesirable outcomes, including boredom (Ntoumanis, 2001), disengagement (Aelterman et al., 2012), and fear of test situations (Schaffner and Schiefele, 2007).

SDT further suggests that autonomous motivation is enhanced when students: (a) feel more in charge of their own learning and experience a sense of freedom and self-endorsement (i.e. autonomy satisfaction); (b) feel more effective (i.e. competence satisfaction); and (c) experience more mutual trust and care with their teachers and classmates (i.e. relatedness satisfaction) (Ryan and Deci, 2017). In contrast, controlled motivation, amotivation, and negative emotions such as anxiety rise when students: (a) experience low need satisfaction or feel pressured to perform well (i.e. autonomy frustration); (b) feel incapable (i.e. competence frustration); or (c) feel disrespected or rejected by the teacher (i.e. relatedness frustration) (Haerens et al., 2015).

Knowledge about the assessment criteria in relation to need-based experiences and motivation

SDT poses that when students better comprehend what is expected from them (which would be the case when they are more knowledgeable about the assessment criteria for an upcoming test), their

basic psychological needs will be satisfied, which in turn will foster autonomous motivation, and dampen controlled motivation or amotivation. In contrast, when students do not know what is expected from them, need satisfaction will be lower or need frustration may rise (e.g. students feel insecure or incapable), which in turn will diminish autonomous motivation and foster controlled motivation or amotivation (Haerens et al., 2015).

So far, there is a lack of evidence to support the above-mentioned premises in relation to students' knowledge about the assessment criteria. Indirect evidence is provided by empirical studies in the general education context. It has been shown that clarity on classroom rules can promote autonomous motivation (e.g. Kunter et al., 2007; Vansteenkiste et al., 2012), though it may also foster pressured forms of motivation (i.e. controlled motivation; Vansteenkiste et al., 2012). Given the call for more explicit assessment criteria in PE (Borghouts et al., 2017; Redelius and Hay, 2012) it would be of interest to know in what way knowledge about the assessment criteria relates to autonomous and controlled motivation, as well as amotivation and anxiety. Moreover, investigating students' need-based experiences may help to increase our understanding of the underlying motivational processes.

The moderating role of teachers' autonomy support or control

Students' need-based and motivational experiences will not only depend on their knowledge about the assessment criteria for an upcoming test. Teachers' general motivating style most certainly will also have a major role to play. SDT suggests that an autonomy-supportive motivating style nurtures students' basic needs and therefore fosters autonomous motivation (Deci and Ryan, 2000). On the other hand, a controlling motivating style may not only undermine these needs, but may also engender need frustration, and in turn elicit controlled motivation or amotivation (e.g. Haerens et al., 2015).

Autonomy-supportive teachers adopt a curious, open and flexible attitude, and are better attuned to their students' feelings and wishes (e.g. Patall, 2013). Autonomy support involves using invitational language (e.g. Vansteenkiste et al., 2004), offering opportunities for input and choice (e.g. Patall et al., 2010), providing a meaningful rationale for expectations and requests (e.g. Assor et al., 2002), following students' pace of progress (Reeve and Jang, 2006), and accepting students' negative affect (Reeve, 2009). A controlling style instead involves a tunnel-view approach by which teachers give priority to their own time-management, agenda and expectations (Aelterman et al., in press). Controlling instructions involve the use of punishing, commanding, yelling and shouting (Assor et al., 2005; Reeve and Jang, 2006), appealing to feelings of guilt and shame or triggering contingent self-worth (Soenens et al., 2012).

Early SDT-based work (Koestner et al., 1984) showed that when limits and rules were communicated in an informational way (i.e. autonomy-supportive), children's intrinsic motivation for a task remained high, while the opposite was true for a controlling approach. Along similar lines, recent studies in general education (Aelterman et al., in press; Jang et al., 2010; Vansteenkiste et al., 2012) revealed that the positive consequences of clarifying goals, expectations and rules are more pronounced when combined with an overall autonomy-supportive style. When students perceived expectations to be clearer, yet autonomy support to be low, higher levels of controlled motivation were found (Vansteenkiste et al., 2012).

Present study

Based on the literature review, we hypothesized in relation to our first research question that knowledge about the criteria for an upcoming test would positively relate to autonomous

motivation (Hypothesis 1a), and we considered the possibility to simultaneously find positive relations with controlled motivation. We expected insignificant or negative relations of knowledge about the criteria for an upcoming test to lead to amotivation and anxiety (Hypothesis 1b). Addressing the second research question, we hypothesized that relations between knowledge about the assessment criteria and student motivation and anxiety would be mediated by experienced need satisfaction (Hypothesis 2). We also explored the mediating role of need frustration. Finally, in relation to our third research question, we examined the hypothesis that the positive relation between knowledge about the assessment criteria and need satisfaction or autonomous motivation, and the negative relations with need frustration, amotivation, or anxiety would be more pronounced when teachers were perceived as highly autonomy-supportive overall (Hypothesis 3a). An opposite pattern of results was expected when teachers would be perceived as highly controlling. Specifically, we expected the positive relationships with need satisfaction and autonomous motivation, and the negative relationships with need frustration, amotivation and anxiety to attenuate, and even considered the possibility to find a positive relation with controlled motivation (Hypothesis 3b). In addressing these hypotheses, we decomposed the variance at the between-student (i.e. individual) and the between-class (i.e. contextual) level, because the extent to which students know the assessment criteria is likely to depend on both individual (e.g. their familiarity with the topic at hand) and contextual factors (e.g. how well the criteria were explained by the teacher).

Method

Participants

A convenience sample of 40 classes and 39 PE teachers (one teacher taught two classes), out of 32 schools in Flanders, Belgium, participated in this cross-sectional study. In total 659 (366 boys; 55.54%, 293 girls; 44.46%) students with a mean age of 14.72 years (standard deviation (*SD*) = 0.94) completed all measures directly after they had participated in their regular PE lesson. On average, 16.48 (range 6–50) students participated per class. All classes consisted of ninth or tenth grade secondary education classes, except for two classes who were from the seventh and eighth grade. All educational types were represented: 43.85% academic education; 33.38% technical education; and 22.61% vocational education.

Ethical considerations. All participating teachers and school principals gave informed consent to participate in the current study. Both students and their parents received an information letter. With the exception of 11 parents, all parents gave informed consent for their child to participate. It was communicated that there were no right or wrong answers and that students' responses would be treated confidentially. The ethical committee of Ghent University approved the study protocol.

Procedure

For the purposes of the present study no manipulations were made to the PE lesson. Participating PE teachers were asked to teach their lessons as planned. No restrictions were made in terms of lesson content. In Flanders, Belgium, PE is a compulsory subject in secondary schools for at least two 50-minute lessons each week. These two 50-minute lessons are sometimes combined into one single 100-minute lesson. For the present study, students filled out a set of questionnaires during

Table 1. Overview of the scales, number of items per scale, Cronbach's alphas and example items.

| Scale | <i>n</i> items | α | Example item Using the stem |
|--------------------------------------|-------------------|----------|---|
| BRPEQ | | | <i>I put effort in the last PE class because . . .</i> |
| Autonomous motivation | 8 | 0.90 | . . . I enjoyed this PE class |
| Controlled motivation | 8 | 0.83 | . . . I felt the pressure of others to participate in this PE class |
| Amotivation | 4 | 0.81 | . . . I thought this PE class was a waste of time |
| BPNSFS | | | <i>During the last PE class . . .</i> |
| Need satisfaction | 12 | 0.85 | |
| Autonomy satisfaction | | | . . . I felt a sense of choice and freedom in the tasks I was participating in |
| Relatedness satisfaction | | | . . . I felt close and connected with other people who are important to me |
| Competence satisfaction | | | . . . I felt that I can successfully complete difficult tasks |
| Need frustration | 12 | 0.90 | |
| Autonomy frustration | | | . . . I felt pressured to do certain tasks |
| Relatedness frustration | | | . . . I felt that people who are important to me were cold and distant towards me |
| Competence frustration | | | . . . I felt disappointed with many of my performances |
| Based upon LASSI | | | <i>During the last PE class . . .</i> |
| Anxiety | 6 | 0.86 | . . . I thought about how bad I performed in comparison to other students |
| Based upon TASCQ | | | <i>During the last PE class . . .</i> |
| Autonomy support | 6 | 0.85 | . . . my teacher gave me the opportunity to choose how to do certain exercises |
| PCT | | | <i>During the last PE class . . .</i> |
| Psychologically controlling teaching | 7 | 0.87 | . . . my teacher made me feel guilty when I disappointed him/her |

Note: BRPEQ, Behavioral Regulations in Physical Education Questionnaire; BPNSFS, Basic Psychological Need Satisfaction and Frustration Scale; LASSI, Learning and Study Strategies Inventory; TASCQ, Teacher as Social Context Questionnaire; and PCT, Psychologically Controlling Teaching scale.

the last 15 minutes of a 50- or 100-minute lesson. The measurements took place at the end of the first or second lesson of a series of lessons on one specific topic (e.g. a set of four basketball lessons).

Measures

Table 1 provides an overview of all questionnaires including exemplary items, reliability coefficients and number of items per scale. Students responded to all items on a five-point Likert scale ranging from “*Not at all true for me*” to “*Very true for me*.”

Knowledge about the criteria for an upcoming test. Students reported on their knowledge about the criteria for an upcoming test by means of one item derived from the Students’ Assessment for

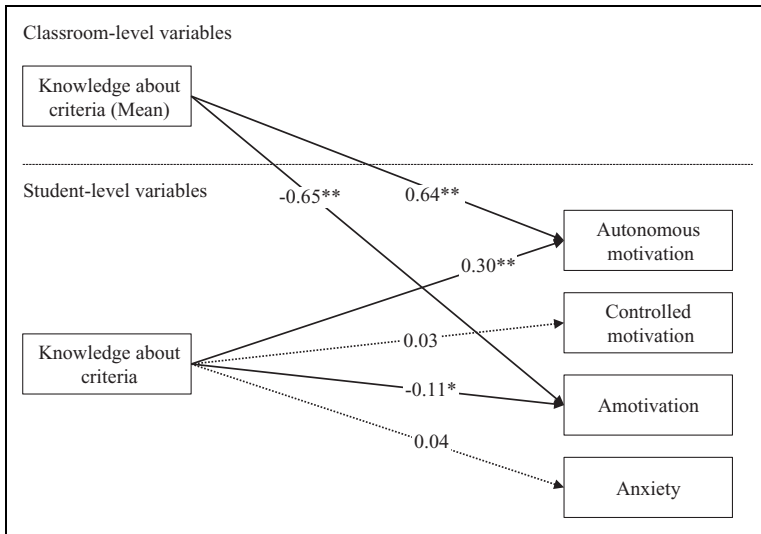


Figure 1. The multilevel model testing the relation between student-level and classroom-level knowledge about assessment criteria and autonomous and controlled motivation, amotivation, and anxiety. * $p < 0.05$; ** $p < 0.01$. For sake of parsimony, only the statistically significant main-effects and cross-level effects derived from the between-person predictor are depicted. All slopes are fixed and path coefficients are in raw metrics.

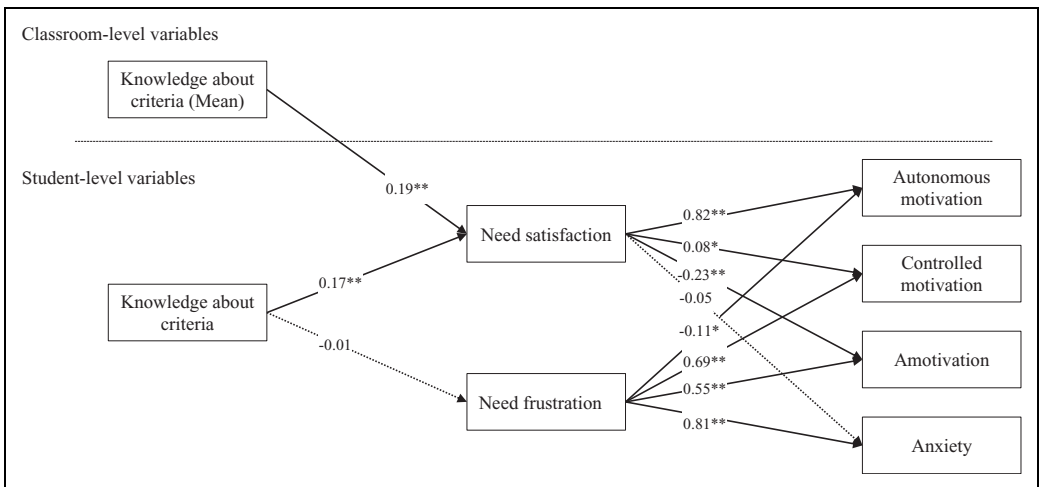


Figure 2. The mediating role of need satisfaction and frustration in the multilevel model testing the relation between student-level and classroom-level knowledge about assessment criteria and autonomous and controlled motivation, amotivation, and anxiety. * $p < 0.05$; ** $p < 0.01$. For sake of parsimony, only the statistically significant main-effects and cross-level effects derived from the between-person predictor are depicted. All slopes are fixed and path coefficients are in raw metrics.

Table 2. Descriptive statistics, bivariate correlations, and intraclass correlation coefficients (ICC) of the measured variables of the study.

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----------------------------|---------|---------|---------|---------|--------|---------|--------|--------|------|
| 1. Knowledge about criteria | – | | | | | | | | |
| 2. Need satisfaction | 0.30** | – | | | | | | | |
| 3. Need frustration | -0.05 | -0.12** | – | | | | | | |
| 4. Autonomous motivation | 0.34** | 0.65** | -0.17** | – | | | | | |
| 5. Controlled motivation | 0.01 | 0.00 | 0.64** | 0.06 | – | | | | |
| 6. Amotivation | -0.21** | -0.27** | 0.48** | -0.46** | 0.39** | – | | | |
| 7. Anxiety | 0.04 | -0.12 | 0.69** | -0.08 | 0.57** | 0.35** | – | | |
| 8. Autonomy support | 0.42** | 0.53** | -0.07 | 0.47** | 0.05 | -0.19** | 0.00 | – | |
| 9. Controlling teaching | 0.00 | -0.01 | 0.55** | -0.05 | 0.44** | 0.37** | 0.38** | 0.19** | – |
| Mean | 3.63 | 3.27 | 2.02 | 3.50 | 2.00 | 1.82 | 2.05 | 3.03 | 2.12 |
| Standard deviation | 1.23 | 0.74 | 0.78 | 0.95 | 0.83 | 0.94 | 0.90 | 0.91 | 0.84 |
| ICC | 0.18 | 0.09 | 0.17 | 0.10 | 0.13 | 0.17 | 0.13 | 0.14 | 0.13 |

Note: * $p < 0.05$; ** $p < 0.01$.

Learning Questionnaire (Pat-El et al., 2013). The item read, “During the last PE class I got to know the criteria by which my test will be evaluated.”

Situational motivation. The Behavioral Regulations in Physical Education Questionnaire (Aelterman et al., 2012) was used to assess students’ situational autonomous motivation, controlled motivation, and amotivation. Confirmatory factor analysis (CFA) using maximum likelihood estimation performed with Mplus version 7.4 (Muthén and Muthén, 2015) indicated reasonable fit (Hu and Bentler, 1999; Kline, 2011), $\chi^2 (148) = 672.70$, $p < 0.001$, root mean square error of approximation (RMSEA) = 0.08 (90% confidence interval (CI): 0.074–0.085), confirmatory fit index (CFI) = 0.89 and standardized root mean square residual (SRMR) = 0.08, all indicator loadings being above 0.55, all $p < 0.001$.

Anxiety. Experienced anxiety during the past PE lesson was measured by means of six items derived from the anxiety subscale of the Learning and Study Strategies Inventory (Weinstein, 1987). Items were adapted to the context of a regular PE lesson (see Table 1). Except for the RMSEA, CFA indicated reasonable fit, $\chi^2 (9) = 80.90$, $p < 0.001$, RMSEA = 0.11 (90% CI: 0.089–0.133), CFI = 0.96, and SRMR = 0.04. All indicator loadings were above 0.62, all $p < 0.001$.

Need satisfaction and frustration. Students’ perceived need satisfaction and frustration were measured with the Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS) (Chen et al., 2015). For the purpose of the present research, small modifications were made to the original BPNSFS to adjust the questionnaire to the PE context (Haerens et al., 2015; Krijgsman et al., 2017). CFA indicated reasonable fit, $\chi^2 (245) = 911.96$, $p < 0.001$, RMSEA = 0.07 (90% CI: 0.060–0.069), CFI = 0.89, and SRMR = 0.07. All indicator loadings were above 0.45, all $p < 0.001$.

Autonomy-supportive and controlling teaching behavior. Students’ perceptions of teachers’ engagement in autonomy-supportive and controlling teaching behavior were measured by means of items from

the Teacher as Social Context Questionnaire (Belmont et al., 1988) and the Psychologically Controlling Teaching scale (Soenens et al., 2012). A two-factor model fitted the data reasonably well, $\chi^2(64) = 346.11$, $p < 0.001$, RMSEA = 0.08 (90% CI: 0.076–0.093), CFI = 0.91, and SRMR = 0.07, with all indicator loadings being above 0.63, all $p < 0.001$. More detailed information (i.e. all scales and subscales, factor loadings of individual items) on the present study's factorial validity is presented as supplementary online data (available at <http://10.1177/1356336X18783983.sagepub.com/supplemental>).

Plan of analyses

Preliminary analyses consisted of descriptive analyses and the calculation of Pearson correlations between all study variables. Moreover, the percentage of students who indicated that they knew the assessment criteria was calculated. We relied on multilevel structural equation modeling in MPlus to investigate all research questions. Specifically, a two-level path model was set up to properly address the nested structure of the data (i.e. students within classes). Before answering our main research questions, we first ran a null model or intercept-only model to estimate how much of the variance was explained at the between-student (i.e. Level 1) and the between-class (i.e. Level 2) levels to answer research question 1, knowledge about the assessment criteria was entered as a predictor at Level 1 and Level 2¹ (Enders and Tofighi, 2007; Lüdtke et al., 2009) in a model including all the four dependent variables (i.e. autonomous motivation, controlled motivation, amotivation, and anxiety; see Figure 1). In a third step, need satisfaction and need frustration were tested as mediators in this model (see Figure 2). Finally, to test our third research question we investigated the interactions between knowledge about the assessment criteria and teachers motivating style in the prediction of the mediators (i.e. need-based experiences) and the dependent variables (i.e. autonomous and controlled motivation, amotivation and anxiety). To do so, we built on the previous model by including teachers' autonomy support and control at the student-level, as well as at the contextual level (see Figures 3 and 4). Yet, we opted for four separate models for each of the dependent variables because preliminary analyses showed that the model would not converge with all dependent variables being simultaneously included in one single model. In all the tested models, slopes of the student level relations were fixed. All predictors at the student-level were group-mean centered (i.e. centered around the class mean), whereas predictors at the class-level were grand mean centered (i.e. centered around the sample mean) (Enders and Tofighi, 2007).

Results

Descriptive statistics and bivariate correlations between study variables are presented in Table 2.

Preliminary analyses

To what extent do students know the criteria for the upcoming test?

Most students indicated that it was “true” (27.0%) or “very true” for them (30.3%) (respectively, score 4 and 5) that during the past PE lesson they got to know the criteria for the upcoming test, 16.5% reported that they knew nothing (8.3%) or only a little about the criteria (8.2%) (score 1–2), and 25.0% were in between (score 3).

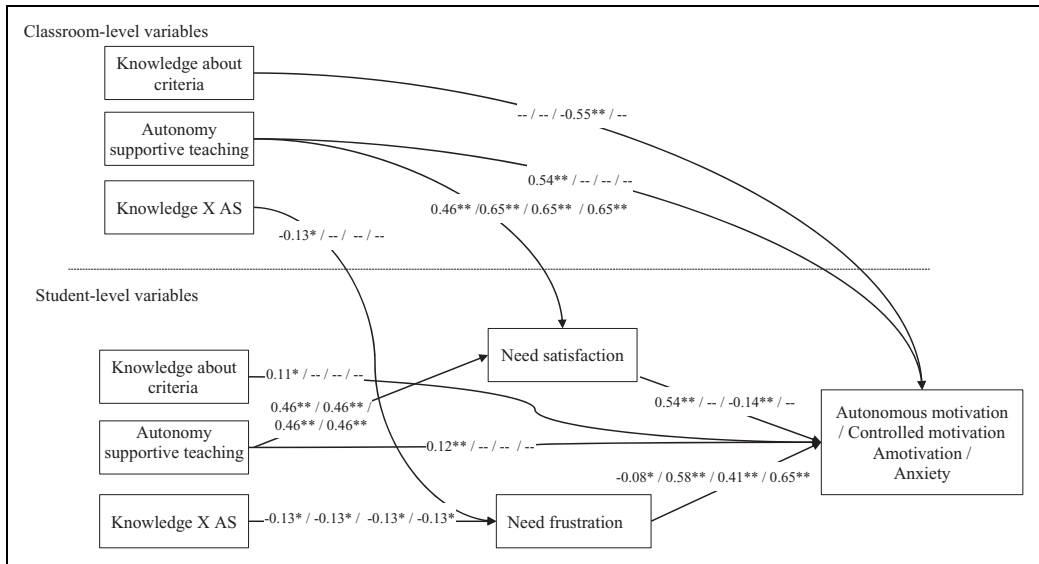


Figure 3. The multilevel path models for the four dependent variables as a function of knowledge about assessment criteria, perceived autonomy support, and their interaction at both the student level and classroom level.
 * $p < 0.05$; ** $p < 0.01$; – nonsignificant. All paths are standardized. The first coefficient refers to the model for autonomous motivation, the second to controlled motivation, the third to amotivation and the fourth to anxiety.

Research question 1

Relationships between knowledge about the assessment criteria and situational motivation for PE, and anxiety.

Inspection of the unconditional model showed that the variance at the class level ranged between 9% (for need satisfaction) and 18% (for knowledge about the assessment criteria) – see interclass correlations in Table 2. As can be noticed in Figure 1, and in support of Hypothesis 1a, knowledge about the criteria for the upcoming test was positively related to autonomous motivation both at the student and at the class levels, explaining respectively 9.6% and 36.3% of the variance. Knowledge about the assessment criteria was not related to controlled motivation. In support of Hypothesis 1b, negative relationships with amotivation were found both at the student-level and at the classroom-level (explaining 1.1% and 35.3% of the variance), but relationships with anxiety were nonsignificant.

Research question 2. Need-based experiences as mediator?

Knowledge about the criteria for the upcoming test, both as a student-level and as a classroom-level predictor, related positively to need satisfaction, which in turn related positively to autonomous motivation and controlled motivation, while relating negatively to amotivation (see Figure 2). A test of indirect effects supported Hypothesis 2, pointing to the mediating role of need satisfaction in the relation between knowledge about assessment criteria and autonomous

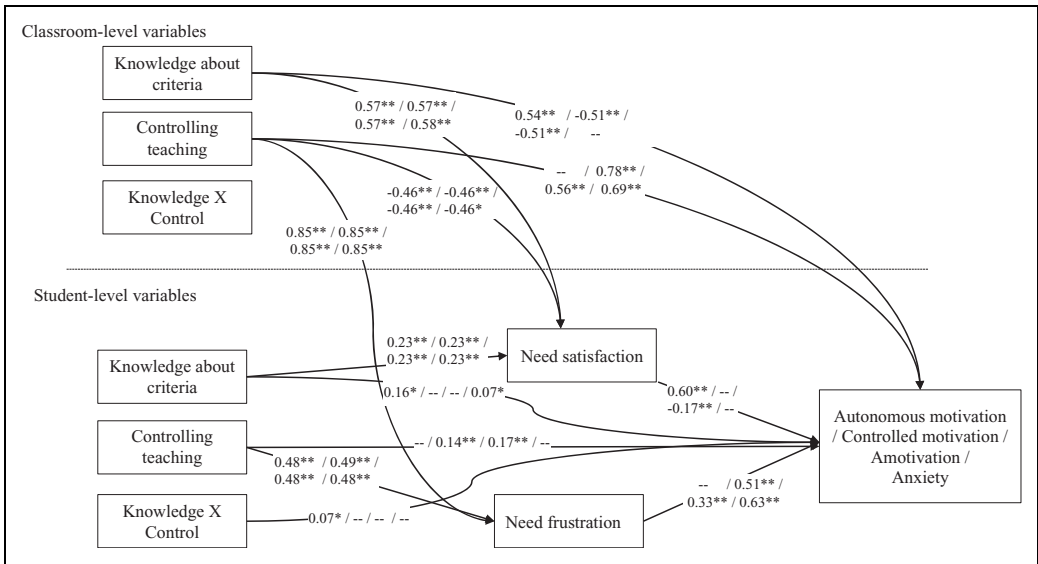


Figure 4. The multilevel path models for the four dependent variables as a function of knowledge about assessment criteria, perceived psychological control, and their interaction at both the student level and classroom level.
 * $p < 0.05$; ** $p < 0.01$; -- nonsignificant. All paths are standardized. The first coefficient refers to the model for autonomous motivation, the second to controlled motivation, the third to amotivation and the fourth to anxiety.

motivation ($b = 0.12$, standard error (SE) = 0.03, $p < 0.01$) as well as amotivation ($b = -0.04$, $SE = 0.01$, $p < 0.01$) at the student level. Knowledge about the criteria either as a student-level or classroom-level predictor did not significantly relate to need frustration, which however related negatively to autonomous motivation and positively to controlled motivation, amotivation and anxiety.

Research question 3

The moderating role of teachers’ motivating style?

As can be noticed in Figure 3, Hypothesis 3a was almost entirely rejected as interactions with perceived autonomy support were non-significant for all the outcomes, except for need frustration.

With regard to this one interaction effect, a test of simple slopes was in support of Hypothesis 3a (see Figure 5). It indicated that the relation between knowledge about the criteria and need frustration at the student level was significantly negative ($b = -0.14$, $SE = 0.06$, $z = 2.45$, $p = 0.014$) only when perceived autonomy support was high (i.e. +1 SD above the mean). Instead, this relation was non-significant when perceived autonomy support was moderate (i.e. around the mean; $b = -0.04$, $SE = 0.03$, $z = -1.32$, $p = 0.19$), or low (i.e. -1 SD below the mean; $b = 0.05$, $SE = 0.04$, $z = 1.22$, $p = 0.22$).

Next, as can be noticed in Figure 4, Hypotheses 3b was not confirmed, as no significant interactions with controlling teaching were found. There was only one exception in the prediction of autonomous motivation at the student-level. Surprisingly, a test of simple slopes revealed that the relation between knowledge about the assessment criteria and autonomous motivation was positive when teachers were

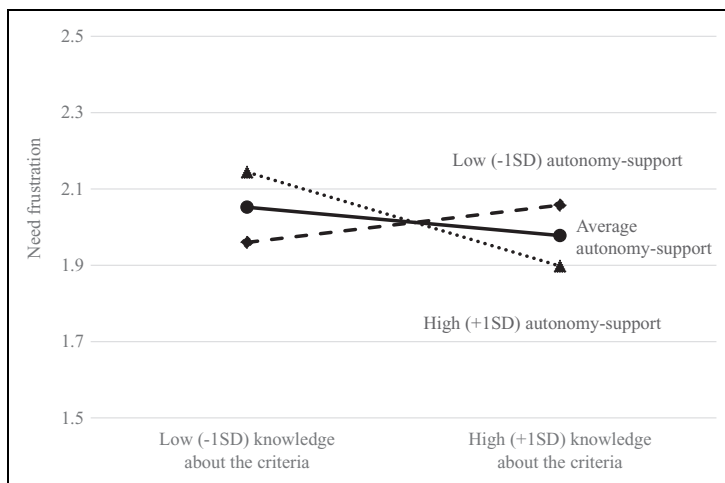


Figure 5. Interpretation of the interaction effect between knowledge about the assessment criteria and perceived autonomy support in relation to need frustration.

Note: the interaction was plotted for the model with autonomous motivation as the dependent variable. Similar results were found for all other outcomes.

perceived to be high (i.e. +1 *SD* above the mean) or moderate on control (respectively $b = 0.20$, $SE = 0.05$, $z = 4.07$, $p < 0.01$ and $b = 0.13$, $SE = 0.03$, $z = 4.10$, $p < 0.01$), whereas it was nonsignificant when the PE teacher was perceived to be low (i.e. -1 *SD* below the mean) on control ($b = 0.05$, $SE = 0.04$, $z = 1.53$, $p = 0.13$). Follow-up analyses revealed that this interaction emerged due to the high correlations between need satisfaction and autonomous motivation. When need satisfaction was removed from the model, the interaction was no longer significant.

Discussion

Assessment quality in PE has received increased attention in the PE community internationally (e.g. Hay and Penney, 2009; López-Pastor et al., 2013). In the present study, we focused on one aspect of assessment quality (see Hay and Penney, 2009; Stiggins et al., 2007), namely whether students in PE know the assessment criteria for an upcoming test. Results revealed that, after participating in the first or second lesson of a series of lessons on the same topic, more than half (57.3%) of the students reported that they had become acquainted (i.e. “I agree...”) with the assessment criteria, while another 25% students reported that they “somewhat agreed.” These findings are in line with the results of Borghouts and colleagues (2017) and Redelius and Hay (2012) among Dutch teachers and Swedish students respectively and may suggest that teachers in PE increasingly create transparency on the assessment criteria, fairly early in the learning process. This is essential as knowing what is expected is a precondition for students to be able to monitor their learning process (Hattie and Timperley, 2007).

Results furthermore revealed that there were significant differences between teachers (i.e. between-class differences) in the degree to which their students knew the assessment criteria, suggesting that teachers differ with respect to how assessment is handled and communicated about (also see Hay and Macdonald, 2008). Yet, our analyses also showed that between-student

differences (84% of the variance) outweighed between-teacher differences (16% of the variance), implying that albeit being taught by the same teacher, students still largely differ in the degree to which they indicate that they know the criteria for the upcoming test. Somewhat in line with these findings, Redelius and Hay (2012) showed that when students were asked about their perceptions of the criteria in PE, they seemed to describe diverse criteria that were often inconsistent with the goals, or criteria, set by the official curriculum. This diversity may be caused by differences in students' personal familiarity with the sport at hand, their cultural or social background, or their cognitive capabilities to process the information provided by the teacher (Hay and Penney, 2009). Yet, it would also be possible that teachers communicate the criteria in a more indirect or implicit way, which would leave more room for students' personal interpretations to be of influence. This would be different when teachers would more explicitly communicate about the assessment criteria, for instance, by using video-examples, rubrics or self- or peer-assessment.

In the current study, we also investigated relations between knowledge about the criteria for an upcoming test and students' motivational and emotional outcomes (Research Question 1). In line with prior SDT-based research that focused on rule clarity (Kunter et al., 2007; Vansteenkiste et al., 2012) and our hypotheses, results showed that students and classes who are more knowledgeable about the assessment criteria enjoy and value the PE lesson more (i.e. autonomous motivation). This is important as students (and classes) who are higher on autonomous motivation tend to be more physically active and engaged during the lesson (Aelterman et al., 2012), report less boredom during PE (Ntoumanis, 2001), and are also more inclined to be physically active outside PE (Hagger et al., 2009).

In addition to these positive associations with autonomous motivation, an important question was whether there were no side effects on controlled motivation, such that students, when being highly aware of the assessment criteria, started to pressure themselves to live up to the criteria (i.e. introjected regulation) or to obtain good grades (i.e. external regulation). Such reasoning was not supported by our data, as being more knowledgeable about the criteria did not relate to controlled motivation. Instead, students and classes who reported that they were more knowledgeable about the criteria indicated lower levels of amotivation. Amotivation is related to a host of negative outcomes in PE (Van den Berghe et al., 2014) and arises when students do not see how their efforts will help them to reach their goals, or when they do not understand why an activity is useful. Our results propose that when students are better informed on the criteria for the upcoming test, rises in amotivation may be prevented. We also investigated whether knowledge about the criteria can prevent students from experiencing anxiety during the PE lessons, as anxiety is a frequently reported problem among secondary school students, particularly in relation to assessment (McDonald, 2001; Stiggins, 2002). Yet, our findings did not provide support for this assumption, as both were unrelated. Perhaps this is the case because we did not measure test anxiety at the contextual level but rather the situational level, that is regarding a specific lesson in which students were not graded. In a previous study (Krijgsman et al., 2017) we showed that anxiety is particularly high in lessons in which students are graded.

Another question was whether need-based experiences served as the underlying mechanism in the relationship between knowledge about the assessment criteria and student outcomes (Research Question 2). In line with our expectations, we found that greater knowledge about the criteria for the upcoming test related to more need satisfaction, which in turn related positively to autonomous motivation and negatively to amotivation. When students have better knowledge about the criteria for the upcoming test, they have a goal towards which they can work. Apparently, students then perceive that they are more in charge of their learning trajectory (i.e. autonomy satisfaction), they

feel more effective in reaching their goals (i.e. competence satisfaction), and they experience better relationships with their teacher (i.e. relatedness satisfaction), which in turn leads them to enjoy and value the lesson more (i.e. autonomous motivation), and to feel less aloof (i.e. amotivation). While some may argue that gaining more insight into the assessment criteria may well lead students to feel more pressured to reach up to the criteria (i.e. autonomy frustration), to feel incapable of meeting the criteria (i.e. competence frustration) or to feel disrespected by the teacher (i.e. relatedness frustration), such assumptions were not confirmed.

This brings us to the final research question (Research Question 3), that is, whether the motivational consequences of knowing the assessment criteria for the upcoming test depended on teachers' general motivating style. Although we hypothesized, based on previous research (Aelterman et al., in press; Vansteenkiste et al., 2012), that the positive relations between knowledge about the assessment criteria and students' motivation could be amplified when teachers hold a more autonomy-supportive style overall, this assumption was not entirely confirmed (but see the findings for need frustration). Overall, both knowledge about the assessment criteria and an autonomy-supportive style showed independent relationships with the motivational outcomes (also see Jang et al., 2010).

Yet, the presence of autonomy support seemed most crucial to foster need satisfaction and autonomous motivation, while knowledge about the assessment criteria appeared most important to dampen amotivation. This is an interesting finding. When students get to know the assessment criteria for a test, this seems to mobilize and energize them, that is, quantitatively speaking they become motivated, as indexed by lower levels of amotivation. This might be the case because knowledge about the assessment criteria helps them to identify how the lessons offered will help them to reach the criteria. However, for students to become in charge of their learning trajectory, feel effective, and connected to the teacher (i.e. need satisfaction) so that they can truly value and enjoy the lesson (i.e. autonomous motivation), obviously more is needed than just knowing the criteria. Indeed, this seemed to more strongly depend on whether the PE teacher held an overall autonomy-supportive approach. We even found that under the condition that students experience their teachers as being highly autonomy-supportive, more knowledge about the assessment criteria will dampen the students' need frustration. Apparently, an additional and unexpected benefit can be created when students know the assessment criteria and concurrently experience their teacher as very autonomy-supportive.

Together, these findings have some important theoretical implications. Speculating that increased knowledge about the assessment criteria follows from the teachers' instructions, students' knowledge about the criteria would be an indirect measure of the teachers' provision of structure (Belmont et al., 1988). If this holds true, our results add to the discussion on the potential tension between the provision of structure and autonomy support (e.g. Jang et al., 2010; Vansteenkiste et al., 2012) and show that "more of both is better".

We were also open to the possibility that knowledge about the assessment criteria could go hand in hand with a controlling approach. This is because previous studies showed that, while setting goals and clarifying expectations, teachers can become rigid and overly script students' behavior (Aelterman et al., in press), resulting in negative motivational outcomes. However, such reasoning was not supported by our findings, as both were unrelated. While this is promising, it is noteworthy to mention that in the current study we mainly measured teachers' reliance on internally controlling strategies such as referring to feelings of shame or guilt or expressing disappointment towards students. In a recent study by Aelterman and colleagues (in press), it was shown that the clarification of goals and expectations particularly aligns with externally controlling strategies,

such as referring to rewards or tests (e.g. marks) and threatening with sanctions, yelling, and commanding.

One unanticipated finding deserves further attention in relation to the synergy with a controlling approach. Specifically, we found that knowledge about the assessment criteria displayed positive relationships with autonomous motivation, if teachers were moderate-to-highly controlling, while no significant relationship was found if teachers were perceived as relatively low on control. This unexpected finding is hard to explain, as it is hard to understand how students, who had better knowledge about the criteria for the upcoming test, would value and enjoy the lesson more if a teacher is relying on internally pressuring tactics such as shaming or guilt induction. Yet, supplementary analyses revealed that this interaction effect appeared very unstable and constituted a statistical artefact caused by the strong relationship between need satisfaction and autonomous motivation. Overall, the findings confirm previous work (e.g. De Meyer et al., 2014; Koestner et al., 1984), in that a controlling approach clearly does more harm than good (i.e. less need satisfaction, more need frustration, more controlled motivation, and more amotivation).

Limitations and future directions

The current study also has some limitations. First, in the current study, we only investigated one aspect of assessment quality (i.e. knowledge about criteria for the upcoming test), while many others (e.g. sound design, student involvement, validity, socially just, authentic, and integrated) are equally important (Hay and Penney, 2009; Stiggins et al., 2007). Second, we investigated it in isolation, while quality assessment is characterized by an integrative approach that connects assessment with curriculum and pedagogy. In future studies, it would be interesting to investigate in detail (e.g. through inspection of field documents) which criteria are communicated, how they align with the learning goals and curriculum offered (e.g. fitness, skills, games, attitudes, and persistence), and which are the pedagogical approaches used (e.g. type of feedback and inclusion of peer-assessment) (Redelius and Hay, 2012). Third, the cross-sectional nature of the study precludes any inferences of causality. In future studies, longitudinal or experimental designs can be used. Fourth, we exclusively relied on self-reported measures of teachers' strategies; in future research these can be complemented with measures of teacher perceptions and direct observations (e.g. Aelterman et al., 2014). Fifth, our measures of students' motivation were situational in nature (i.e. in relation to one specific PE lesson). In future studies, it would be interesting to measure students' motivation both at the situational (i.e. with respect to the specific lesson) as well as at the contextual level (i.e. regarding PE more generally). Indeed, while students may display a specific motivational pattern in one specific lesson, they also bring their general motivation for the subject at hand to the lesson. By controlling for students' contextual motivation towards PE, the situational impact of teaching strategies can be more precisely investigated.

Finally, it would also be informative to examine in more detail whether teachers communicated about the assessment criteria in an autonomy-supportive or more controlling way, rather than measuring teachers' overall engagement in autonomy-supportive and controlling teaching.

Conclusion and implications

Results of the current study showed that most students in PE indicated that they know the criteria for an upcoming test. This is important, as when students in PE indicated they knew the criteria for an upcoming test, they not only valued and enjoyed the lesson more, they were also less likely to

feel aloof or disconnected. The reason why students felt this way is that they perceived that they were more in charge of their learning trajectory (i.e. autonomy satisfaction), felt more effective in reaching their goals (i.e. competence satisfaction), and experienced better relationships with their teacher (i.e. relatedness satisfaction). In addition, more knowledge about the criteria for an upcoming test did not necessarily relate to feelings of pressure to live up to the criteria (i.e. introjected regulation) or to obtain good grades (i.e. external regulation). If students experienced their teachers as being highly autonomy-supportive, more knowledge about the assessment criteria for an upcoming test even negatively related to feelings of need frustration. The findings of the current study thus emphasize the need to search for effective approaches to develop students' knowledge about the criteria for an upcoming test, while at the same time relying on an autonomy-supportive approach. To do so, teachers will do well if they offer choices whenever possible (e.g. the level of difficulty of the assessment task), provide meaningful rationales for the chosen criteria (e.g. in relation to the goals they want to attain with their students), actively solicit students' opinion (e.g. "do you think you are sufficiently prepared for the assessment?"), and accept rather than suppress the irritation or negative emotions that the assigned assessment tasks might elicit (e.g. if students feel stressed or look anxious). By giving voice to students' wishes, concerns, and problems, students might feel respected and hence, be more volitional in their learning. Finally, when explaining assessment criteria for an upcoming test, PE teachers can try to refrain from relying on internally controlling practices such as referring to feelings of shame and guilt, given that such strategies relate to negative motivational and emotional outcomes.

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Authors' contribution

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Supplemental material

Supplemental material for this article is available online.

Note

1. To check psychometric quality of aggregated constructs, interclass correlations 2 (ICC2s) were calculated. With values of 0.78 for knowledge about criteria, 0.74 for autonomy support and 0.72 for controlling teaching, the ICC2s indicated acceptable to good levels of reliability (LeBreton and Senter, 2008; Lüdtke et al., 2009).

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