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Observed Need Support

# Observing Physical Education Teachers' Need-Supportive Interactions in Classroom Settings

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According to self-determination theory, teachers can motivate students by supporting their psychological needs for relatedness, competence, and autonomy. The present study complements extant research (most of which relied on self-report measures) by relying on observations of need-supportive teaching in the domain of physical education (PE), which allows for the identification of concrete, real-life examples of how teacher need support manifests in the classroom. Seventy-four different PE lessons were coded for 5-min intervals to assess the occurrence of 21 need-supportive teaching behaviors. Factor analyses provided evidence for four interpretable factors, namely, relatedness support, autonomy support, and two components of structure (structure before and during the activity). Reasonable evidence was obtained for convergence between observed and student perceived need support. Yet, the low interrater reliability for two of the four scales indicates that these scales need further improvement.

**Keywords:** need support, observation, teaching behavior, motivation, self-determination theory

During the past two decades, studies on teachers' interpersonal style and behavior have increasingly been conducted from the perspective of self-determination theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2000). The attractiveness of SDT for the practice of education lies in its claim that the support of students' basic psychological needs for autonomy, competence, and relatedness plays a pivotal role in their behavior and psychological adjustment. Numerous studies on education in general (e.g., Jang, Reeve, & Deci, 2010) and on physical education (PE) in particular (e.g., Standage, Duda, & Ntoumanis, 2005, 2006) led to the formulation of empirically supported recommendations for teachers on how to nurture learners' psychological needs. The majority of these studies measured need-supportive classroom practices through self-reports. The present contribution aimed to gain a different insight into the notion of need support by using observational measures. Although a few previous studies (e.g., Tessier, Sarrazin, & Ntoumanis, 2008, 2010) used observations of teachers' behaviors, most of these studies had one or more limitations, including a reliance on small samples, a unique focus on one specific teaching style dimension, and the use of single items to rate teacher need support. In the current study we used a

coding system capturing different dimensions of teacher need support in terms of teachers' support for the needs for autonomy, competence, and relatedness, with each dimension being represented by multiple teacher behaviors. We then applied this coding system to a relatively large sample of teachers.

## Need-Supportive Teaching Behaviors

Within basic psychological need theory, one of the five mini-theories of SDT (Ryan & Deci, 2002[AUQ1]; Vansteenkiste, Niemiec, & Soenens, 2010), the needs for autonomy, competence, and relatedness are identified as fundamental psychological nutrients for optimal motivation and well-being. Self-determination theory also specifies which social contexts are more likely to contribute versus undermine the satisfaction of these needs (e.g., Deci & Ryan, 1987).

Autonomy refers to the experience of being the initiator of one's own actions and to the experience of psychological freedom when engaging in an activity (Assor, Kaplan, & Roth, 2002; Deci & Ryan, 2000). Accordingly, teacher autonomy support entails *identifying*, *nurturing*, and *developing* pupils' personal motivational resources, such as their interests,

preferences, and personal goals (Reeve, 2009). To identify learners' personal motivational resources, teachers display a sincere interest in the learners' preferences and actively listen to them, so that their voices are heard. Teachers acknowledge students' perspectives and problems, thereby accepting rather than countering negative feelings that arise during the PE class (Reeve, Jang, Hardre, & Omura, 2002; Jang et al., 2010). In addition to identifying pupils' interests and preferences, autonomy-supportive teachers also try to nurture these motivational resources (Reeve, 2009) through the provision of interesting, challenging, and relevant activities that are likely to attract students' curiosity (e.g., demonstration of intrinsic value; e.g., Vansteenkiste, Simons, Soenens, & Lens, 2004), by offering meaningful choices (Mouratidis, Vansteenkiste, Sideridis, & Lens, 2011; Prusak, Treasure, Darst, & Pangrazi, 2004) or by creating opportunities for initiative taking (Reeve & Jang, 2006). Further, autonomy-supportive teachers try to use noncontrolling or inviting language (e.g., Simons, Dewitte, & Lens, 2003; Vansteenkiste et al., 2004) and they explain the personal relevance of the learning activities when they attempt to develop new motivational resources (Deci, Eghari, Patrick, & Leone, 1994; Reeve & Jang, 2006).

Competence refers to pupils' experience of a sense of effectance and to the display of confidence to achieve desired outcomes (Skinner & Belmont, 1993; Sierens, Vansteenkiste, Goossens, Soenens, & Dochy, 2009). Structure then refers to those teaching behaviors that contribute to the development of competence among pupils (Grolnick & Pomerantz, 2009). One key feature of structure involves the communication of clear and understandable guidelines and expectations (Farkas & Grolnick, 2010; Jang et al., 2010; Sierens et al., 2009; Vansteenkiste et al., 2012). The setting of clear expectations is a prerequisite for children to develop a sense of effectiveness, as without any clear guidelines they are simply left confused and cannot make progress toward a particular goal. Similarly, the provision of help during activities (Jang et al., 2010) is critical to overcome problems, but does not guarantee that children will ultimately manage to effectively engage in the required activities. Other components of structure are more directly nurturing people's need for competence. For instance, when PE teachers provide positive feedback children feel competent to engage in the requested activity (Koka & Hein, 2005; Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008).

Relatedness refers to development of positive and mutually satisfying relationships, characterized by a sense of closeness and trust (Baumeister & Leary, 1995; Ryan & Deci, 2000). Interpersonal involvement (Grolnick & Ryan, 1989), one aspect of relatedness support, is characteristic of PE teachers who are dedicated to their pupils, thereby spending a considerable amount of time, energy, and resources on them. Next to involvement, which represents a relatively quantitative feature of relatedness support (reflecting the

degree of engagement displayed by teachers), relatedness support also involves a more qualitative feature, reflecting the extent to which teachers interact with their students in a warm, friendly, and affectionate fashion (Cox & Williams, 2008; Soenens, Duriez, Vansteenkiste, & Goossens, 2007).

## Research on Need-Supportive Teaching

The general aim of the present observational study was to complement past work on teacher need support, most of which was either experimental or self-reported in nature. In our view, each of the three major ways of tapping into teacher need support (e.g., self-report, experimental, observational) has its own pros and cons and it is the conjoined consideration of the findings obtained across these three research lines that enriches our understanding of need-supportive dynamics.

While experimental studies allow for the inference of causal conclusions, most of these studies were conducted in the laboratory rather than in real-life settings, which reduces their ecological validity. In experimental studies, one or two need-supportive components (e.g., choice; e.g., Patall, Cooper, & Robinson, 2008) are typically isolated and experimentally varied (Vansteenkiste, Williams, & Resnicow, 2012), not answering the question to what extent different need-supportive teaching practices co-occur. In contrast, the direct assessment of students' perceived need support through self-reports allows examining to what extent different need-supportive practices co-occur naturally.

We argue that observational studies complement experimental and self-reported studies in a number of ways. First, observation studies have high *ecological validity* as real classes are registered and teachers' real-life need-supportive behaviors are mapped out. This allows one to gain insight into the frequency with which need-supportive behaviors occur. In principle, some need-supportive practices that have been studied intensively in the laboratory may rarely occur in daily life. In addition, it is possible that some need-supportive practices are more salient at the beginning of the class, whereas others are more relevant toward the middle or the end of a class. Finally, the microanalysis of PE teachers' need-supportive practices may produce richer insights in the way need support gets manifested more concretely in the context of PE.

Second, observation studies can provide new information about the *internal and external validity* of need-supportive practices. With regard to internal validity, it might be the case that some teaching practices may simultaneously nurture several psychological needs. For instance, students who have the feeling that their teacher works from their perspective might both experience a greater sense of relatedness (Sheldon & Filak, 2008) and be more volitional (e.g., autonomous) in putting effort into the learning activity (Reeve, 2009). Similarly, rationale provision may represent a feature of both autonomy

support (Assor et al., 2002) and structure (e.g., Farkas & Grolnick, 2010). As for external validity, observations allow one to examine the degree of convergence between the rated observations and the need support subjectively experienced by the students.

Third, once developed, an observation schema can be used to evaluate the *impact of interventions*, in which PE teachers are trained to adopt a more need-supportive teaching style (e.g., Edmunds, Ntoumanis, & Duda, 2008; Reeve, Jang, Carrell, Jeon, & Barch, 2004; Tessier et al., 2008, 2010). Finally, an important fourth advantage of the observed teaching behaviors is that they yield vivid and very concrete illustration material to be used in *teacher training*. Observations may help teachers to gain insight into the potential discrepancies between their self-evaluation and their actual behavior. Awareness of such discrepancies may be an important catalyst for change in the direction of a more need-supporting style. Tessier et al. (2010), for instance, showed that teachers implemented more need-supportive strategies after a training during which they observed and discussed their own teaching style based on video images of their own lessons.

## The Present Study

Building on previously developed coding systems (e.g., Edmunds et al., 2008; Reeve et al., 2004; Tessier et al., 2008; 2010), we examined the frequency and timing of occurrence of observed need-supportive teaching behaviors during a regular PE lesson. We developed a broad pool of items of need-relevant behaviors comprising all three needs rather than just autonomy support, and used these items as a guide to observe and rate videos of PE lessons in a large sample of secondary school PE teachers.

We pursued three broader aims. First, we examined the factor structure of the rated need-supportive teaching behaviors, thereby expecting to find at least three factors mapping onto each of the three needs. Yet, we were open to the possibility that more than three factors would emerge, as some dimensions might be multifaceted. For instance, autonomy support has been described as involving the identification, nurturance, and development of inner preferences, interests, and values (Reeve & Jang, 2006), and some components of structure (e.g., clarifying expectations) are considered a prerequisite for competence to be developed, while others (e.g., positive feedback) are more directly supportive of the need for competence. In addition, we were interested to see where a number of specific teaching behaviors that have been described as characteristics of more than one dimension (e.g., empathy and provision of a rationale) would load. To substantiate the obtained factor structure, we added global ratings of teachers' support for autonomy, competence, and relatedness to the factor analyses to examine whether these ratings would load onto their respective factors. Finally, we examined the scales'

internal consistency, together with their intrarater and interrater reliability.

A second aim was to examine the change versus stability of these observed need-supportive dimensions during an entire class period. For instance, although the clarification of expectations might especially be prevalent at the beginning of the class, these practices might be observed less toward the middle and the end of a PE class period. A third aim was to investigate relationships between observed need-supportive teaching behaviors and the perceptions of need support by the pupils. Given that correlations between observations and perceptions of socialization figures' behavior have even been found to be low in effect size, even in dyadic relationships such as the parent-child relationship (e.g., Lorenz, Melby, Conger, & Xu, 2007), we hypothesized to find significant, yet small, relationships between observed and perceived need support in the teaching context.

## Method

### Procedure

After being contacted by telephone, principals of 43 secondary schools agreed to participate in the current study. Physical education teachers of these 43 schools were contacted and informed about the study and the planned measurements, resulting in a sample of 74 PE teachers that gave approval to participate in the study by means of informed consent forms. In Flanders (Belgium), PE is a compulsory subject in secondary schools taught by specialized teachers for two 50-min lessons each week (including time for transportation and clothing). In some schools the two 50-min lessons are combined into one single 100-min lesson.

Teachers were asked to provide an overview of their scheduled PE lessons. For the current study, data were gathered in one planned lesson either on games (e.g., volleyball) or on artistic sports (e.g., dance). Two weeks before the assessment, all pupils received an informed consent form to be signed by their parents. The informed consent form explained the study purposes and asked for parents' authorization for their child to be videotaped and to participate in the study. Pupils who did not return a signed informed consent form did not participate in the observed lesson.

Physical education classes were videotaped using digital camcorders. The camcorder was positioned on a fixed spot in the gymnasium in such a way as to capture a maximum view of the ongoing class. In addition, teachers were equipped with a small microphone fixed on their shirt. At the end of each lesson, 10 min was reserved for teachers and pupils to be able to fill out the questionnaire. The present study is part of a larger research project of which the goal is to investigate motivational dynamics in a large sample of teachers and pupils. The study protocol was approved by the Ethical Committee of Ghent University.

## Participants

The sample of the current study consisted of 74 teachers ( $M = 37.5$ ;  $SD = 10.8$  years), of which 62% were men. Teachers had on average 14.4 ( $SD = 11.1$ ) years of teaching experience. Fifty-one percent of the teachers had a bachelor's degree and 49% had a master's degree in PE. The classes included 14 pupils on average. Of the participating classes 30%, 15%, and 55% were only boys, only girls, and mixed gender classes, respectively. More than half of the classes (e.g., 56%) were in an academic track, 22% were in a technical track, and 21% were in a vocational track.<sup>1</sup> All secondary school grades were equally represented in the sample, with 32%, 32%, and 36% of the participants being in 7th-8th, 9th-10th, and 11th-12th grade, respectively. A sample of 910 out of 1229 pupils (mean age 15.2,  $SD = 1.9$ , 54% boys) returned a signed informed consent form, were present at the day of measurement, and accurately filled out the Teacher as Social Context Questionnaire (TASCQ; Belmont, Skinner, Wellborn, & Connell, 1988).

## Measures

### Observations.

Twenty-one possible need-supportive behaviors were observed (see the appendix for an overview of all behaviors). The items were selected based on an extensive review of the existing literature regarding characteristics of need-supportive teaching (e.g., Reeve et al., 2004; Reeve & Jang, 2006; Tessier et al., 2008; Vansteenkiste, Zhou, Lens, & Soenens, 2005). An expert panel, consisting of both PE teachers and researchers specialized in the field of SDT, observational measures, and PE, gathered during three panel meetings to observe and code videotapes of PE classes. After group discussion, individual items were revised, refined, and elaborated, and meaningful examples for each of the observed behaviors were added. During the third meeting, each of the experts independently coded two PE classes using the revised list of teaching behaviors. Problems or doubts raised during the coding process were registered and discrepancies in interpretation of different teaching behaviors were discussed, which led to a final refinement in the observed behaviors and the addition of some more illustrative examples.

The 21 need-supportive behaviors were coded every 5 min using a 4-point frequency scale, ranging from 0 (*never observed*) to 1 (*sometimes observed*), to 2 (*often observed*), and to 3 (*observed all the time*). We chose a 5-min interval over a 3-min or 10-min interval because initial inspection of the videotapes revealed that a meaningful and sufficiently large amount of teaching behavior occurred during 5-min units. An average of 7.5 ( $SD = 2.8$ ) intervals per lesson was coded for each of the 21 behaviors. In total, 11,655 5-min intervals were coded for the purpose of the current study. In addition to this microanalytical coding, the observers also scored their impression of teachers' global provided autonomy

support, structure, and relatedness support using a 4-point scale at the end of the class. In doing so, they based themselves on the operational definitions of these three teaching dimensions as found in the literature (Reeve, 2006). The complete list of items can be found in the appendix.

### Teacher and Child Background Characteristics.

Teacher and child background characteristics, including age, gender, diploma, and years of teaching experience (in the case of the teachers) were measured by means of a questionnaire. Further, the pupils answered one additional question, asking whether the videotaped lesson differed from other lessons taught by the same teacher on a 5-point scale ranging from 1 (*this lesson was totally similar*) to 5 (*this lesson was totally different*). Fifty-seven of the 74 classes (77%) had an average score lower than 3, indicating that most pupils did not perceive strong differences between the observed lesson and previous lessons taught by the same teacher.

### Perceived Need Support.

Pupils' perceived need support was measured by means of a slightly adapted version of the short version of the Teacher as Social Context Questionnaire (TASCQ; Belmont et al., 1988). The Dutch version of this questionnaire has been validated in previous research (Sierens et al., 2009). For the purpose of the current study, the questionnaire was adapted to the context of PE by including the stem "During the PE lesson you just completed . . ." and by replacing specific references to academic subjects. For instance, the item "My teacher gave me lots of choices about how I do my schoolwork" was changed into "My teachers gave me lots of choices on how to deal with the exercises." As two of the negatively worded items in the relatedness support scale (e.g., "The teacher just did not understand me" and "I could not count on my teacher when I need him/her") reduced the internal consistency of the scale, these were removed. For the same reason, two items were removed from the structure scale ("The teacher acted differently, every time I did something wrong" and "My teacher kept changing how he/she acted towards me") and the autonomy support scale ("My teacher is always getting on my case about how I engage in exercises during the lesson" and "It seemed like my teacher was always telling me what to do"). The scales including the negatively worded items displayed internal consistencies of respectively 0.71, 0.55, and 0.65, as determined by Cronbach's alpha. Removing these items resulted in a more internally consistent scale for "perceived relatedness support" (e.g., "My teacher really cared about me,"  $\alpha = 0.78$ ), "perceived structure" (e.g., "The teacher explained his expectations to me";  $\alpha = 0.76$ ), and "perceived autonomy support" (e.g., "My teacher explained how I can use the things we learned in PE,  $\alpha = 0.78$ ), each consisting of six items.

## Plan of Analyses

To examine the factor structure of the observed 21 proposed need-supportive teaching behaviors (Aim 1), exploratory factor analyses (EFA) using principal component analyses were conducted using SPSS version 20.0. Factor analyses were conducted on the aggregated 5-min interval scores, divided by the number of 5-min intervals per PE lesson period. Next to the scree test (Cattell, 1966), Monte Carlo parallel analyses were conducted to determine the number of factors to be retained, which is said to represent the most accurate method for this purpose (Henson & Roberts, 2006). Promax with Kaiser normalization for nonorthogonal rotation was used to allow retained factors to be correlated. As recommended (Henson & Roberts, 2006), both factor pattern coefficients and factor structure coefficients were reported.

Factor composite scores were created by multiplying the rating for each of the practices by its corresponding loading on the factor and summing these values. The advantage of calculating factor composite scores is that items with a higher, relative to those with lower, factor loadings have a stronger influence on the total sum score. In addition, no decisions regarding the exclusion of cross-loadings have to be made when the obtained factor structure is more complex (DiStefano, Zhu, & Míndrilă, 2009). To establish the construct validity for the retained factors, we repeated the factor analyses, this time adding the three global ratings of autonomy support, structure, and relatedness support next to the 21 need-supportive practices. We then inspected whether these global ratings loaded appropriately onto the retained factors. Further, three trained observers independently coded 30 identical videotapes of PE lessons to assess interrater reliability, whereas one observer coded the same 20 lessons twice 2 weeks apart to assess intrarater reliability. Intrarater and interrater reliabilities were calculated by means of intraclass correlation coefficients (ICC), thereby using a two-way random model. Although limits for levels of reliability are fairly arbitrary, values below .50 are considered as poor, whereas values from .50 to .75 and above .75 are considered as moderate and good, respectively (Portney & Watkins, 2009, p. 82). To determine internal consistency of the retained factors, internal consistencies as indexed by Cronbach's alpha were calculated. For these analyses, items with factor pattern coefficients greater than 0.30 were considered as sufficiently high. Finally, correlations between factor composite scores were calculated by means of Pearson  $r$  correlations.

To examine the prevalence of the rated need-supportive dimensions during the course of a PE lesson period (Aim 2), the first two 5-min and final two 5-min intervals of each lesson period were aggregated to create scores for the beginning and the end of the lesson, respectively. For the middle of the lesson, aggregated scores were created by summing the ratings of the remaining 5-min intervals, which could vary from 1 to

11 depending on the lesson length. Similar to previous analyses, factor composite scores were created for the beginning, middle, and end of the lesson by multiplying the ratings for each of the practices by its corresponding factor loading and summing these values. These time-specific factor composite scores were then simultaneously entered as within-subjects variables in the repeated measures MANOVA (with lesson period as a within-subjects factor and the four dimensions of need support as dependent variables) to examine whether and how the retained factors changed throughout a PE lesson. Both multivariate and univariate  $F$ -values were inspected.

All these analyses were conducted with SPSS version 20.0.

To examine the convergence between rated teacher need support and pupil perceived need support (Aim 3) we made use of MLwiN version 2.20 (Rasbash, Steele, Browne, & Goldstein, 2009). The data were conceptualized as a two-level hierarchical model, consisting of 910 pupils at Level 1 and 74 classes (or teachers) at Level 2. A baseline variance components model (Rasbash et al., 2009) or intercept-only model (Hox, 2010) was used to evaluate how much of the variation in perceived need support was situated at the class (e.g., Level 2) versus the pupil level (e.g., Level 1). Next, we examined whether the need support as observed by external raters related to the variation in perceived child need support at the class level. All quantitative explanatory variables were mean centered before entering them in the multiple predictor models.

## Results

### Aim 1: Assessing the Factor Structure of 21 Observed Need Supportive Teaching Behaviors

Monte Carlo parallel analyses with 21 variables and 100 replications supported a four-factor solution. Consistent with this, the scree plot indicated a clear drop in eigenvalues between the fourth and the fifth factor (e.g., from 2.09 to 1.17). Together, the four retained factors explained 57.6% of the variance in the observed need-supportive teaching behaviors. Table 1 presents item communalities ( $h^2$ ) together with the factor pattern and factor structure coefficients. Communalities ranged between 0.37 and 0.79, whereas the factor loadings after promax rotation were, with the exception of one item (e.g., "The teacher encourages pupils to persist") all above .30. This one low loading item was removed from further analyses.

\ Insert Table 1 \

Four teaching practices (see Table 1) loaded exclusively on the first factor, which explained 18.7% of the variance and was labeled "Relatedness Support." Three other items with cross-loadings also loaded above

.30 on this first factor. The second factor, explaining 15.1% of the variance, consisted of five practices, of which four loaded exclusively on this factor. Given the content of the items (see Table 1), this factor was labeled “Structure Before the Activity.” The third factor consisted of seven practices, of which six loaded exclusively on this factor. It explained 13.8% of the variance. Because these practices refer to the provision of guidance and support during the activity, this factor was labeled “Structure During the Activity.” Finally, four items loaded on the fourth factor, of which two were cross-loadings. This factor was labeled “Autonomy Support” and explained 9.9% of the variance.

The labeling of the factors was largely confirmed after adding the global ratings of relatedness support, structure, and autonomy support to the factor analyses. Overall ratings of relatedness support and autonomy support loaded significantly on the retained relatedness support (e.g., 0.58) and autonomy support (e.g., 0.69) factors, respectively. Overall ratings of structure loaded exclusively high (e.g., 0.52) on the factor “Structure Before the Activity,” but did not load on the factor “Structure During the Activity.” In contrast, global ratings of relatedness support yielded a cross loading (e.g., 0.36) on the latter factor.

Table 2 presents the internal consistencies and intrarater and interrater reliabilities for each of the retained factors. As can be noticed, three of the four retained factors were sufficiently internally consistent (all  $\alpha$ s above 0.69). For the autonomy support scale, internal consistency was moderate ( $\alpha = 0.59$ ). Intrarater reliabilities of all retained factors were good (all ICCs  $\geq 0.82$ ). Interrater reliabilities were of variable quality, being good for structure before the activity and autonomy support, moderate for structure during the activity, and poor for relatedness support. Finally, the correlations between the factor composite scores are presented in Table 3. As can be noticed, none of the observed need support dimensions were significantly related, with the exception of a negative association between structure during the activity and autonomy support.

\ Insert Tables 2 and 3 \

## Aim 2: Prevalence of Rated Need-Supportive Practices

The means displayed in Table 1 reveal that the occurrence of each of the teaching behaviors ranges between 0.20 and 1.89 on a scale from 0 to 3. The repeated-measures MANOVA with relatedness support, structure before and during the activity, and autonomy support as measures (see Figure 1) provided evidence for a significant multivariate within-subject effect of lesson period,  $F(1,69) = 13.32, p \leq .001$ . Repeated-measures univariate analyses revealed a significant linear time effect for both structure before,  $F(1,69) =$

$73.31, p \leq .001$ , and during the activity,  $F(1,69) = 11.28, p \leq .001$ , but not for relatedness support,  $F(1,69) = 3.11, ns$ , and for autonomy support,  $F(1,69) = 0.26, ns$ .

\ Insert Figure 1 \

Structure before the activity was most prominent in the beginning of the lesson and decreased during the rest of the lesson. For structure during the activity, the quadratic trend also appeared significant,  $F(1,69) = 29.02, p \leq .001$ . As can be noticed in Figure 1, structure during the activity was most prominent in the middle part of the lesson, thus providing further evidence for the label assigned to this factor.

## Aim 3: Convergence Between Observed and Perceived Need Support

Before examining the degree of convergence between the rated and perceived need support, we examined whether there was significant between-class-level variance in perceived need support. This was the case for all three dimensions of perceived need support. Although the majority of the observed variance was situated at the between-pupil level, respectively 11.8%, 13.6%, and 15.2% of the variance in perceived relatedness support,  $\chi^2(1) = 13.4, p \leq .001$ , perceived structure,  $\chi^2(1) = 14.7, p \leq .001$ , and perceived autonomy support,  $\chi^2(1) = 16.4, p \leq .001$  was situated at the between-class level. We then proceeded by predicting these class differences in perceived need support based on the observed class differences in need support (see Table 4). There was a significant relation between observed and perceived relatedness support and between observed and perceived autonomy support. However, for neither of the two structure components was a significant relationship with perceived structure found. Surprisingly, a significant positive relationship between observed relatedness support and perceived structure was found. In a follow-up analysis, we broke down our perceived structure scale down into two subcomponents, representing the rated structure before and during the activity. A trend toward a significant relationship between observed structure before the activity and perceived structure before the activity,  $B = 0.04, SE = 0.02, \chi^2(1) = 2.83, p = .09$ , was found.

\ Insert Table 4 \

## Discussion

The present study aimed at enhancing our understanding of need-supportive dynamics in PE by complementing existing experimental and self-reported work with observational data. We had three main purposes. First, as only few observational scales for need-supportive teaching behaviors in PE and exercise are available (see

Edmunds et al., 2008, and Tessier et al., 2008, for exceptions), we began by investigating the factor structure of observers' ratings of a fairly broad range of possible need-supportive teaching behaviors. Second, the fluctuations in need-supportive teaching behaviors throughout the course of a regular PE lesson were mapped out. Finally, relations between observed and pupil perceived teaching behaviors were investigated.

### **Aim 1: Factor Structure of 21 Observed Need-Supportive Teaching Behaviors**

In total, 74 PE classes were videotaped and each of 21 hypothesized need-supportive teaching behaviors were coded during 5-min intervals. Factor analyses provided evidence for four factors that could be directly linked to theoretically proposed need-supportive dimensions within SDT, namely, autonomy support, structure, and relatedness support. Interestingly, observed structure was found to be multifaceted, with one factor relating to structure before the activity and another factor relating to structure during the activity.

The relatedness support factor comprised two sets of observed behaviors. Behaviors such as being empathic, asking questions, and paying attention to what the pupils want to say are perhaps most directly indicative of the quality of teachers' relatedness support. These behaviors reflect a positive, friendly, and warm teacher–pupil interaction in which the teacher tries to take the child's perspective. Interestingly, this dimension of relatedness support may not only be emotional, but also more physical in nature, as the one item that tapped into physical closeness to the teacher also loaded onto this factor. A second set of items reflected teaching behaviors such as being enthusiastic and eager and putting effort and energy into the lesson, which are more indicative of the quantity of teachers' involvement during the PE class. Enthusiasm represents a positive form of involvement, which was observed to co-occur with teachers' engagement in warm interactions. In academic settings, enthusiasm has also been identified as an essential feature of a motivating teaching style (Patrick, Hisley, & Kempler, 2000).

The labeling of this factor was justified by the fact that the global assessment of relatedness support significantly loaded onto this factor. Although the observed behaviors formed an internally consistent scale and the intraindividual reliability was high, the interrater reliability was poor and, hence, deserves further empirical scrutiny. Because relatedness support involves judging the emotional quality of the teacher–student relation, some of the practices appeared to be difficult to rate (e.g., “The teacher takes the perspective of the pupils into account, is empathic”) and, therefore, were more subject to the observers' interpretation of the situation.

Further, consistent with Reeve and Jang's (2006) description of structure as a multifaceted concept, two facets of structure were identified based on the specific moment the structure was provided in the lesson (e.g.,

beginning vs. middle of the lesson). Similar to previous research (Farkas & Grolnick, 2010; Jang et al., 2010; Sierens et al., 2009), structure before the activity consisted of practices such as giving clear verbal instructions, demonstrating activities, and providing an overview of the lesson, which are a prerequisite for pupils to build a sense of competence. If pupils do not know what is expected of them, they are unable to meet these expectations and will fail to develop new skills. In line with previous studies (Koka & Hein, 2005; Mouratidis et al., 2008; Sierens et al., 2009), structure during the activity involved practices such as helping the pupils, giving advice and guidelines, providing positive feedback, and monitoring whether pupils live up to the instructions.

While overall ratings of structure significantly loaded on the component of structure before the activity, this was not the case for structure during the activity. Perhaps when rating the overall level of structure, external observers primarily thought of the amount of clear expectations and instructions that were provided. Individually, each facet of structure formed an internally consistent scale with a high intraindividual reliability. The interrater reliability was good for structure before the activity and moderate for structure during the activity. In addition, both dimensions of structure were unrelated. Although such findings confirm the theoretical assumption that structure is a multifaceted construct (Reeve & Jang, 2006), the null relation between both raises the question whether they really belong to the same overarching construct. Farkas and Grolnick (2010) also reported low to moderate correlations between different facets of parental structure. However, it is also possible that the lack of association reflects the nature of dynamic teaching environments. For example, at the start of a lesson, a teacher is likely to have all the pupils expecting structure, they are grouped together and are listening. It might be easier for some teachers to give clear guidelines and instructions, clarify expectations, and provide demonstrations in such a context. During the ongoing activities, the context changes and teachers have to manage the class, pupil behavior, safety, and a noisy environment. At that time, multiple groups of pupils engage in different activities sometimes at different levels. For some teachers, providing structure might be more difficult at this point due to such competing demands. Therefore even a teacher who gives a lot of structure before the activity may not necessarily be able to give a large amount of structure during the activity.

Finally, an autonomy-supportive factor was retained that consisted of practices such as asking questions and paying attention to what the pupils are saying. Such practices allow teachers to identify pupils' values, interests, and preferences. Further, providing choice and opportunities to practice independently also loaded on this factor. These behaviors are considered autonomy-supportive teaching behaviors because they

stimulate self-regulation and initiative and are assumed to nurture inner motivational resources. This factor also formed an internally consistent scale with good intraindividual and interrater reliability.

Although these four meaningful factors could be retained, a number of interesting cross-loadings emerged deserving some more in-depth discussion. First, the practice of “asking questions about wishes, values, interests, or problems” was found to cross-load on relatedness support, autonomy support, and structure during the activity. Possibly, depending on the type of question asked, the teacher appeals to different needs. Questions about interests, wishes, or values may be more closely related to autonomy support (e.g., “Who wants to sit on the side for a moment to watch the entire choreography?”) whereas questions about feelings may be more relevant for relatedness support (e.g., “Are you not feeling well today?”), and questions about problems (e.g., “Would you pass or score in this situation?”) can be considered as a practice to enhance structure. Thus, in future research, this item might be better broken down into three different subcomponents to examine this possibility.

Second, offering a rationale for tasks and exercises yielded cross-loadings on both facets of structure, but failed to load on autonomy support. In that respect, one could argue that the results are supportive of the assumption that offering a rationale for tasks and exercises is in essence (or in practice) a component of structure. As suggested by Farkas and Grolnick (2010), providing a rationale, independently of the content or tone, nurtures the need for competence because it clarifies how an individual might increase his or her competence on an important task or explains how a task fits into the overall lesson plan. A rationale will then only foster a sense of autonomy if students believe it is a meaningful and personally relevant reason to put effort in the activity and if it is delivered in an autonomy-supportive way (Deci et al., 1994; Farkas & Grolnick, 2010; Jang, 2008; Reeve et al., 2002). Likely, in the context of PE, rationales rather deal with how different exercises logically follow each other such that pupils see how the class is structured (e.g., “We are moving on quickly today, because the jump we are practicing is rather easy”).

### **Aim 2: Prevalence of Rated Need-Supportive Practices**

To our knowledge, this is the first study to examine the frequency of occurrence of observed relatedness support, structure, and autonomy support during both the entire course and specific parts (beginning, middle, end) of a PE lesson. In line with expectations, structure before the learning process was more prominent at the beginning of the lesson, whereas structure during the learning process reached its peak toward the middle of the lesson. The items that were part of the autonomy-supportive factor were the least frequently observed.

Specifically, teachers were rarely providing choice to their pupils and hardly provided opportunities to practice independently. In addition, although applying differentiation is strongly recommended in PE teacher education programs, this practice was not often observed. In PE, a small number of intervention studies already illustrated that teachers are capable of teaching in a more autonomy-supportive way by trying to listen more to the pupils (Mandigo, Holt, Anderson, & Sheppard, 2008), or by providing more opportunities for self-initiative (e.g., Mandigo et al., 2008) and choice (Prusak et al., 2004). These findings highlight the need for PE teacher education programs and continuous professional development programs to include a module on how to teach in an autonomy-supportive way. The focus should, however, not only be on autonomy support, as the observations revealed that there is room for teachers to be more need supportive on each of the need-relevant dimensions. In addition, for some of the structure-related teaching behaviors, such as offering help during exercises, one would expect that they occur more frequently, whereas autonomy-supportive teaching behaviors (e.g., offering choice to all students) are less likely to frequently occur.

### **Aim 3: Relation Between Observed and Pupil Perceived Need Support**

Taken as a whole, the findings provide reasonable evidence for the idea that observed need-supportive teaching behaviors are perceived as such by the pupils. Specifically, both rated autonomy support and relatedness support related to the corresponding perceived dimensions by pupils. Yet, no significant relations between observed and perceived structure were found, whereas an unanticipated yet interesting relation between observed relatedness support and perceived structure was obtained. When teachers were observed to adopt a more empathic, enthusiastic, and warm teaching style, pupils perceived more structure. This finding is consistent with Farkas and Grolnick’s (2010) suggestion that moderate levels of parental involvement are required for parents to provide structure. In the current study, perceived structure was assessed by means of such items as “The teacher showed me how to independently solve problems” and “The teachers only proceeded if I managed to effectively engage in the exercises.” Children seemed more likely to endorse these items if their teacher was observed as more involved and warm, which seems a prerequisite to provide help attuned to the needs of the children. In addition, in the TASCQ items, no distinction was made between structure before and during the activity. When relating structure before the activity to perceived communication of expectations, a marginal significant relation was found. Future studies can try to capture different components of structure in pupils’ self-reports, as well as in observational measures to assess the relation between both in greater detail.



As perceptions of need support have been found to relate to optimal motivation and positive behavioral and affective outcomes in students (Black & Deci, 2000; Jang, Reeve, Ryan, & Kim, 2009; Standage et al., 2006), our findings imply that a more frequent implementation of the observed strategies may lead to better educational outcomes. Future intervention studies can confirm this hypothesis.

Although observed and perceived need support were interrelated, these relations were far from perfect. This may have been the case for a number of reasons. First, students may have had teachers' general rather than their course-specific need-supportive style in mind when filling out the questionnaires at the end of the PE class. Said differently, the global perceived teaching style may have colored their answers on the lesson-specific questionnaires, reducing the convergence. Second, the between-person variance in perceived need support largely outweighed the between-class variance. This suggests that there exists substantial heterogeneity in pupils' perceived teaching style during a single PE class, although they were exposed to the same teacher. To overcome this problem, raters would have to code individual teacher-pupil interactions, as teachers can interact differently with different (groups of) pupils in the classroom. Third, observers may benefit from having additional information on whether and how the topic was addressed in the class before the one that was recorded, or on pupils' competence level for the topic at hand. Such additional information might be helpful to rate, for instance, whether the given information and expectations were truly necessary for the pupils to build their competence.

In our view, the modest associations between observed and perceived teacher behavior are not just a methodological problem as they also raise interesting substantive questions. Given that it seems likely that some students perceive the teacher's behavior more accurately than others, the question arises whether these students would also benefit more when being taught by a more need-supportive teacher (e.g., in terms of motivation and performance). Another important question is whether features in the students' own functioning determine the degree to which they perceive the teacher's behavior accurately. Possibly, students' degree and quality of engagement in PE and their motivational orientation toward PE are important determinants of their perceptions of the teacher behavior. For instance, a student with an autonomous orientation toward PE may be relatively more sensitive to and energized by a teacher's actual display of need-supportive behavior than a student with a relatively more controlled orientation. To the extent that research would confirm this possibility, it would underscore the importance of targeting both teachers' behavior and students' motivational orientation in prevention and intervention attempts to increase the quality of students' PE experience.

## Limitations

In interpreting the current findings, some methodological limitations need to be considered. First, only need-supportive behaviors were assessed. In follow-up research, a similar set of need-thwarting behaviors need to be developed to allow for a deeper exploration of dysfunctional motivational dynamics in PE. One important question to be addressed is whether the presence of need-thwarting teaching behaviors can simply be equated with an absence of need support. Possibly, need thwarting is a qualitatively different phenomenon than an absence of need support, such that it has specific outcomes in the PE context (Bartholomew, Ntoumanis, Bosch, & Thøgersen-Ntoumani, 2011[AUQ3], Tessier et al., 2008). Ideally, future research would include indicators of both need support and need thwarting simultaneously and would address their unique and combined associations with both adaptive and maladaptive outcomes in the domain of PE.

Another limitation relates to the exclusive focus of PE as a subject of the lessons. Adapting and applying the coding scheme to a wider range of subjects would strengthen the conclusions. Third, only two items loaded exclusively on autonomy support. As stable factors generally consist of five or more items with loadings of more than 0.50 (Costello & Osborne, 2005), more efforts are required to more fully capture this dimension.

A fourth limitation is the low interrater reliability for relatedness support. This might suggest that observer bias has occurred, despite the expert panel meetings and training sessions organized for the raters. Further research is needed to investigate whether further revisions of the items or a more intensified training can improve interrater reliability, while simultaneously retaining relationships with pupils' perceptions of provided relatedness support by the teacher. Alternatively, two or three external raters could observe the same videotape to obtain a more reliable picture.

## Future Directions

In the current study, prevalence of need-supportive practices in a real-life setting such as PE was mapped out through an observational study. Although factor analyses on the 21 observed need-supportive items revealed a clear-cut structure representing all three needs and reasonable evidence was obtained for convergence between observed need-supportive teaching behaviors and pupils' perceptions of need support, the reasons for the lower interrater reliability for two of the four scales need to be further explored.

For the current study, we mainly focused on specific teacher practices. In a next study, the items for practices such as asking questions or providing a rationale can be further refined, thereby separating the content of the practice and the style of communicating the practice (e.g., a controlling versus an autonomy-supportive way of asking a question). This will be

crucial, as several studies have shown that the positive effects of specific teaching behaviors (e.g., positive feedback) on autonomous motivation will enlarge when these are embedded in an overall autonomy supportive context (Deci & Ryan, 1987).

Third, in intervention studies, observations such as described in the current study will be of additional value to evaluate an intervention's effectiveness because observations allow one to code "real" changes in need-supportive teaching practices after exposure to an intervention on need-supportive strategies (e.g., Reeve et al., 2004).

Finally, in the current study, teaching behavior was observed from the perspective of SDT, leading to the inclusion of 21 possible need-supportive practices. Although we tried to create a broad and extensive list of possible need-supportive teaching practices, there might have been other teaching behaviors that frequently occurred that were not captured in the current study. Future studies across other target groups (e.g., other cultures, age groups) and in other subjects can also move this line of research forward.

## Note

1. The academic track is a very broad form of general education preparing students for higher education. The technical track also offers a form of general education, but with a less theoretical and more technical and practical approach. The vocational track prepares secondary school students for the labor market immediately after secondary school.

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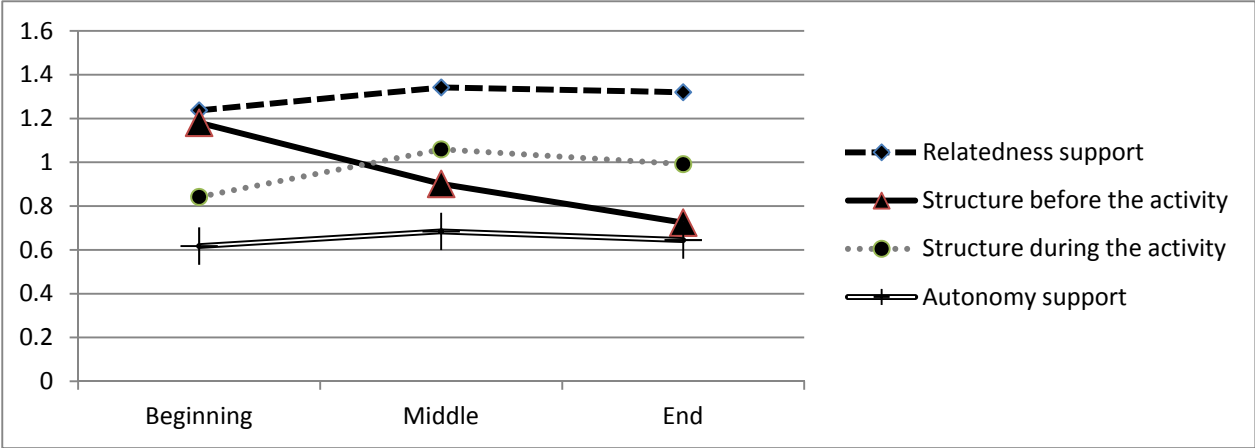
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**Figure 1** — Prevalence of observed need-supportive teaching behaviors over an entire lesson period. *Note.* Beginning = first two 5-min intervals, End = last two 5-min intervals, Middle = all intervals in between.

**Table 1 Factor Loadings of Pattern Matrix and Structure Matrix of the Observed Need-Supportive Teaching Behaviors Rotated to the Promax Criterion**

	<i>M</i> ± <i>SD</i>	Relatedness Support	Structure		Autonomy Support	<i>h</i> <sup>2</sup>
			Before	During		
... is enthusiastic and eager	1.71 ± 0.71	<b>.86</b> /.85	.01/.06	-.01/.11	-.24/-.21	.79
... takes the perspective of pupils into account, is empathic	1.66 ± 0.82	<b>.83</b> /.84	-.06/-.02	.09/.16	.20/.21	.76
... puts effort and energy into the lesson	1.69 ± 0.84	<b>.78</b> /.78	.27/.32	-.10/.01	-.29/-.25	.76
... is physically nearby the pupils	1.84 ± 0.68	<b>.74</b> /.77	.08/.11	.19/.25	.18/.18	.66
... pays attention to what the pupils are saying	1.20 ± 0.70	<b>.66</b> /.64	-.36/-.32	-.16/-.12	<b>.34</b> /.39	.68
... provides variation between or within exercises	1.22 ± 0.66	-.05/.01	<b>.78</b> /.77	.05/.00	.09/.07	.61
... gives clear (verbal) instructions	2.01 ± 0.64	.11/.16	<b>.76</b> /.77	.22/.24	-.32/-.35	.77
... demonstrates the tasks himself, is a “model” for the pupils	0.82 ± 0.75	.10/.10	<b>.63</b> /.65	-.33/-.33	-.10/-.07	.54
... gives an overview of the content and structure of the lesson	0.26 ± 0.25	-.03/-.00	<b>.60</b> /.60	.02/-.02	.05/.04	.37
... offers the pupils a rationale for tasks and exercises	0.32 ± 0.28	.03/.11	<b>.46</b> /.44	<b>.44</b> /.40	.21/.16	.41
... uses pupils as positive role models	0.20 ± 0.28	-.51/-.44	.15/.11	<b>.50</b> /.41	.18/.10	.47
... offers help during exercises	1.19 ± 0.60	-.09/.01	.13/.09	<b>.78</b> /.75	.12/.02	.60
... offers pupils (apart from instruction) new guidelines, tips and advice during the exercises	0.57 ± 0.41	-.01/.08	-.06/-.08	<b>.69</b> /.70	-.09/-.17	.51
... addresses pupils by their first name when the opportunity occurs	1.89 ± 0.83	-.04/.00	-.40/-.42	<b>.62</b> /.65	-.17/-.23	.61
... provides positive feedback	1.21 ± 0.70	.10/.12	-.44/-.45	<b>.54</b> /.60	-.30/-.35	.64
... monitors if the pupils consequently live up to the (verbal) instructions	1.67 ± 0.73	.20/.27	.28/.28	<b>.51</b> /.55	-.20/-.26	.46
... asks the pupils questions about their interests, problems, values or wishes	0.85 ± 0.46	<b>.36</b> /.42	.01/.01	<b>.49</b> /.49	<b>.34</b> /.29	.49
... offers choice to all pupils	0.26 ± 0.30	.08/.11	.02/.01	.05/-.03	<b>.76</b> /.75	.58
... gives pupils the opportunity to practice independently and to solve problems on their own, without interfering	0.82 ± 0.63	-.02/-.00	-.20/-.21	.00/-.08	<b>.70</b> /.70	.53
... applies differentiation	0.20 ± 0.31	<b>.45</b> /.46	.13/.15	-.04/-.05	<b>.45</b> /.47	.44
... encourages pupils to persist	0.99 ± 0.65	.15/.13	-.34/-.33	.14/-.23	-.52/-.53	.44
Initial Eigenvalue	—	3.93	3.17	2.90	2.09	—
Percentage of Variance	—	18.7%	15.1%	13.8%	9.9%	—

*Note.* Factor pattern coefficients and factor structure coefficients are both presented (factor pattern/factor structure). Factor pattern coefficients greater than .30 are indicated in bold type. *h*<sup>2</sup> = communality coefficient.

**Table 2 Internal Consistencies, Intrarater and Interrater Reliability as Indexed by Intraclass Coefficients for Each of the Factor Composite Scores**

	Internal Consistency ( $\alpha$ )	Intrarater Reliability ( $N = 20$ )	Interrater Reliability ( $N = 30$ )
Relatedness Support	0.83	0.82	0.06
Structure			
Before the activity	0.69	0.97	0.81
During the activity	0.70	0.92	0.49
Autonomy Support	0.59	0.97	0.83

*Note.* <0.50 = poor; >0.50 to <0.75 = moderate; >0.75 = good.

**Table 3 Correlations Between Factor Composite Scores**

	2	3	4
1. Relatedness Support	0.11	0.15	0.03
2. Structure Before the Activity	—	-0.21	-0.11
3. Structure During the Activity		—	-0.30**
4. Autonomy Support			—

\*\* $p \leq .01$ .

**Table 4 Relationships Between Observed Need-Supportive Behaviors and Pupil Perceived Need Support**

	Perceived Relatedness Support			Perceived Structure			Perceived Autonomy Support		
	<i>B</i> (SE)	$\beta$	$\chi^2(1)$	<i>B</i> (SE)	$\beta$	$\chi^2(1)$	<i>B</i> (SE)	$\beta$	$\chi^2(1)$
Fixed Part: Observations									
Relatedness support	0.03 (0.01)	0.12	5.35*	0.03 (0.02)	0.11	3.84*	0.02 (0.02)	0.06	1.23
Structure before the activity	-0.01 (0.02)	-0.02	0.13	0.02 (0.02)	0.04	0.49	-0.02 (0.02)	-0.05	0.74
Structure during the activity	-0.01 (0.02)	-0.03	0.29	-0.00 (0.03)	-0.00	0.02	0.01 (0.03)	0.03	0.21
Autonomy support	0.02 (0.03)	0.04	0.50	0.02 (0.02)	0.03	0.35	0.07 (0.04)	0.12	4.06*
<hr/>									
Random Part: Intercept-Only Model									
	$\sigma^2$ (SE)								
Class-level variance	0.06 (0.02)		13.44***	0.08 (0.02)		14.73***	0.10 (0.02)		16.41***
Pupil-level variance	0.45 (0.02)			0.51 (0.03)			0.53 (0.03)		
<hr/>									
Random Part: Multiple Predictor Model									
Class-level variance	0.05 (0.02)			0.07 (0.02)			0.08 (0.02)		
Pupil-level variance	0.45 (0.02)			0.51 (0.03)			0.53 (0.03)		
<hr/>									
Test of Significance									
Reference model	1932.41		6.21**	2037.04		5.20*	2093.64		6.93**
Deviance (-2LL)	1926.20			2031.84			2086.71		

\*\*\* $p \leq .001$ ; \*\* $p \leq .01$ ; \* $p \leq .05$ .



## Appendix: List of Observed Need-Supportive Teaching Behaviors

The teacher . . .		Minutes			
		0–5	5–10	10–15	. . .
1	asks <u>questions</u> about interests, problems, wishes or values (e.g., “Does everyone understands what we are going to do?”, “Which exercises do you find hard to engage in?”, “Would you like to try it with music already?”, Did you understand the explanation?”, Are you not feeling well today?”)				
2	offers <u>choice</u> to the students (e.g., choice in the order of the exercises, choice in materials: in baseball pupils can choose between a tennis racket or a bat to hit the ball, pupils can choose to engage in the exercises barefoot or not, pupils can choose on which level of difficulty they engage in an exercise)				
3	offers the opportunity to <u>experience</u> problems, to <u>practice independently</u> , to <u>experiment</u> , to exercise and to solve problems on their own, without interfering (e.g., before pupils get an explanation about the lay-up, they first get the opportunity to practice; pupils engage in exercises without being told what to pay attention to).				
4	offers the pupils a specific <u>explanation</u> , rationale for rules, tasks or exercises (e.g., this is important because . . . , placing one foot in front of the other helps because it will improve your balance, don’t bounce with the ball during the instruction so that everyone is capable of hearing me, which will allow to start with the exercises faster). Emphasizing the importance of an exercise is also part of this practice.				
5	gives an <u>overview</u> of the content and structure of the lesson (e.g., formulates lesson goals, explains how different exercises fit into the entire lesson: “We are almost there, the warm-up is finished now, we will do three additionally preparatory exercises and then we will jump on the plinth”.)				
6	gives clear verbal instructions				
7	monitors if the pupils <u>consequently</u> live up to the (verbal) instructions (e.g., pupils perform exercises as instructed)				
8	uses <u>variation</u> between and within exercises				
9	applies <u>differentiation</u> (e.g., the teacher provides exercises with a different degree of difficulty, taking into account the possibilities of different (groups of) pupils.				
10	offers pupils (apart from instruction) new <u>guidelines, tips and advice</u> (e.g., “you can try to do X or Y). Remark: only code this practice if the teacher provides new information, <u>new elements</u> that were not addressed in the overall instruction.				
11	offers <u>positive feedback</u> (e.g., “well done”, “you played really well”)				
12	<u>encourages</u> pupils to persist (e.g., “come on, you can do it”). Remark: code this item quantitatively, independent of the content of the way the encouragement is delivered [AUQ6]				
13	uses pupils as positive role models				
14	offers help during exercises				
15	addresses pupils by their <u>first name</u> when the opportunity occurs. Remark: code the proportion of using and not using the first name when the opportunity occurs.				
16	is physically nearby the pupils				
17	is enthusiastic and eager				
18	puts effort and energy into the lesson				
19	takes the <u>perspective</u> of pupils into account, is <u>empathic</u> (e.g., the teacher uses age-adapted language, the teacher asks the pupils if they are managing)				
20	<u>pays attention</u> to what the pupils are saying (how well is the teacher capable of listening to the pupils)				

21	demonstrates the tasks himself, serves as a “ <u>model</u> ” for the pupils				
<b>Total impression of need support</b>					
	To what degree was the teacher autonomy supportive?				
	To what the degree did the teacher offer structure?				
	To what degree was the teacher relatedness supportive?				



## Author Queries

[AUQ1] The in-text citation "Ryan & Deci, 2002" is not in the reference list. Is the year 2000 intended? Or should it be Deci & Ryan? Please correct the citation, add the reference to the list, or delete the citation.

[AUQ2] "However, for neither of the two structure components was a significant relationship with perceived structure found."

Is your meaning intact? The original was, "However, for none of the two structure components, a significant relationship with perceived structure was found."

[AUQ3] The in-text citation "Bartholomew, Ntoumanis, Bosch, & Thogersen-Ntoumani, 2011" is not in the reference list. Add *Ryan* to the list after *Bosch*? Please correct the citation, add the reference to the list, or delete the citation.

[AUQ4] Reference "Deci, Ryan, 2002" is not cited in the text. Please add an in-text citation or delete the reference.

[AUQ5] Reference "Vansteenkiste, Sierens, Soenens, Goossens, Dochy, Aelterman, Beyers, . . ., in press" Is this cited in the text as Vansteenkiste et al., 2012? Please verify the editor's update here.

[AUQ6] For Item #12, "independent of the content of the way the encouragement is delivered," should the second preposition of be or? Thus: "independent of the content or the way the encouragement is delivered"