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The effects of an experimental programme to support students' autonomy

Running Head: Autonomy-supportive training and overt behaviours of teaching

The effects of an experimental programme to support students' autonomy on the overt
behaviours of physical education teachers

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Abstract

Although the benefits of autonomy supportive behaviours are now well established in the literature, very few studies have attempted to train teachers to offer a greater autonomy support to their students. In fact, none of these studies has been carried out in physical education (PE). The purpose of this study is to test the effects of an autonomy-supportive training on overt behaviours of teaching among PE teachers. The experimental group included two PE teachers who were first educated on the benefits of an autonomy supportive style and then followed an individualised guidance programme during the 8 lessons of a teaching cycle. Their behaviours were observed and rated along 3 categories (i.e., autonomy supportive, neutral and controlling) and were subsequently compared to those of three teachers who formed the control condition. The results showed that teachers in the experimental group used more autonomy supportive and neutral behaviours than those in the control group, but no difference emerged in relation to controlling behaviours. We discuss the implications for schools of our findings.

Key words: Autonomy support, controlling behaviours, teaching style, motivational climate, physical education, self-determination, motivation.

The effects of an experimental programme to support students' autonomy on the overt behaviours of physical education teachers

It is well established in the literature that students' intrinsic motivation levels decrease as they become older (e.g., Harter, 1981; Fredericks & Eccles, 2002; Otis, Grouzet, & Pelletier, 2005). While motivation is inherently an individual level variable, it can be greatly affected by contextual factors, such as teaching styles (Turner & Patrick, 2004; Turner, Meyer, Cox, Logan, DiCinto, & Thomas, 1998).

Based on the self-determination framework (SDT; Deci & Ryan, 2002), the goal of this paper is to test the effects of an autonomy-supportive training programme on overt behaviours of teaching among physical education (PE) teachers. Over the last two decades, SDT has established itself as a heuristic theoretical framework to study individuals' behaviours in several life contexts, including school. This theory proposes that social factors, such as teachers' interpersonal style, influence students' motivation and engagement by nurturing *versus* thwarting three of their basic needs. These are the needs for competence (i.e., the desire to interact efficiently with one's environment), autonomy (i.e., the desire to be the origin of one's own behaviour), and relatedness (i.e., the desire to feel connected to and accepted by significant others). According to this theoretical framework, the interpersonal style of those in position of authority can be conceptualized along a continuum that ranges from highly controlling to highly autonomy supportive (Deci, Schwartz, Sheinman, & Ryan, 1981). In essence (see Reeve 2002 for a review), controlling teachers tend to *take charge* (e.g., take control of the instructional materials, use directives/commands), *be in a hurry* (e.g., lead students towards the right answer before students have time to reflect on possible options), *be negative* (e.g., criticise, reprimand students for their mistakes), and *motivate through pressure* (e.g., use rewards/threats and exhortations). In contrast, autonomy

supportive teachers are more *responsive and empathic* (e.g., respect students, spend time to listen and acknowledge students' feelings and perspectives), more *supportive* (e.g., praise the students' endeavours of mastery), and more *accountable* (e.g., provide a rationale for tasks or for restrictions they impose). Finally, autonomy supportive teachers *provide choice and opportunities* for initiative taking and independent work. Generally, students are responsive to the effects of these different styles (for a review, see Deci & Ryan, 1987; Deci, Vallerand, Pelletier, & Ryan, 1991; Reeve, 1996, 2002). For example, students of autonomy-supportive teachers, compared to students of relatively controlling teachers, show greater perceived competence (e.g., Deci et al. 1981; Ryan & Grolnick, 1986; Trouilloud et al., 2006), intrinsic motivation (e.g., Deci, Nezlek, & Sheinman, 1981), creativity (e.g., Amabile, 1979; Koestner, Ryan, Bernieri, & Holt, 1984), preference for optimal challenge (e.g., Harter, 1978; Pittman, Emery, & Boggiano, 1982; Shapira, 1976), conceptual understanding (e.g., Benware & Deci, 1984; Boggiano, Flink, Shields, Seelbach, & Barrett, 1993; Flink, Boggiano, & Barrett, 1990), positive emotionality (e.g., Ryan & Connell, 1989), and academic performance (e.g., Boggiano et al., 1993; Flink, Boggiano, & Barrett, 1990), and are less likely to drop out from school (Vallerand et al., 1997). In turn, student self-determined motivation predicts leisure-time physical activity intentions (e.g., Ntoumanis, 2001; Standage, Duda, & Ntoumanis, 2003), preference for optimally difficult tasks (e.g., Standage, Duda, & Ntoumanis, 2003), concentration (e.g., Ntoumanis, 2005) and effort (e.g., Ntoumanis, 2001) in the class.

Nevertheless, despite the benefits of an autonomy-supportive style, many teachers report that the concept of autonomy is an unfamiliar – even a foreign – concept (e.g., Boggiano et al., 1987). Most of them use spontaneously controlling strategies (Newby, 1991); the same holds true for PE teachers (Sarrazin, Tessier, Pelletier, Trouilloud, & Chanal, 2006). Given that an autonomy supportive interpersonal style is more the exception than the rule in the school environment, and in PE specifically, a paramount question is whether it is possible

to help teachers modify their existing teaching style from a relatively controlling to a more autonomy-supportive one.

To our knowledge, two studies have explored this question (i.e., Reeve, 1998; Reeve, Jang, Carrell, Jeon, & Barch, 2004). In Reeve (1998), 159 pre-service teachers participated in a programme intended to modify their teaching style. The teachers were randomly assigned into one of three experimental groups. One condition emphasised the importance of being autonomy supportive toward students. The second condition promoted the use of a controlling style. The third condition was a control one and used neither autonomy supportive nor controlling strategies. The educational programme lasted 45 minutes and entailed reading an instructional booklet. This booklet had the same structure in each group; after a definition of key concepts, a description of one of the three instructional strategies (autonomy supportive, controlling or neutral) was followed using case studies as a medium. Then, the educational benefits of the particular teaching strategy were emphasised, and finally a brief rationale was offered as to why experts in educational psychology valued this particular instructional strategy. The effects of the programme were assessed at the end of the workshop. Compared to those who read an instructional booklet on a controlling and a neutral teaching style, pre-service teachers who read the instructional booklet on autonomy supportive strategies reported an increase in their autonomous orientation. However, this study featured two important limitations. First, the teachers' actual behaviours were not assessed. A self-reported interpersonal style may or may not be actualized during classroom instruction. Second, Reeve (1998) did not differentiate among the dimensions that constitute an autonomy supportive style. This is important as we need to know which behaviours are prone to change. For example, it is possible that some teachers improve their capacity to support student autonomy because they better acknowledge the students' perspectives and/or because they provide more opportunities for taking initiatives. In order to study more precisely the effects of an

educational programme on teachers' interpersonal style, it is necessary to distinguish between different categories of autonomy-supportive behaviours.

This limitation was addressed in the Reeve et al. (2004) study. In order to assess the effects of an autonomy supportive training programme on teachers' behaviours, the experimenters developed an observational grid differentiating the following four aspects of an autonomy-supportive interpersonal style: nurture inner motivational resources; rely on informational, non-controlling language; promote value in uninteresting activities; and acknowledge and accept students' expressions of negative affect. Twenty experienced teachers (as opposed to pre-service teachers as in Reeve, 1998) of maths, economics, English, and science, were recruited to participate to the study which took place over a 10-week period. The intervention aimed to educate teachers about how to support students' autonomy and consisted of two components. The first was a presentation of the basic tenets of self-determination theory, including the different types of student motivation, their consequences, and the characteristics of an autonomy-supportive (focusing on the four dimensions identified in the observational grid) and a controlling teaching style. The second component of the intervention consisted of a study-specific interactive website. The website was designed to help teachers translate the four autonomy-supportive instructional behaviours they learned about during the informational session into their own classroom practice. For instance, participating teachers could access samples of what a classroom teacher might say and do to enact each autonomy-supportive behaviour via audio and audio-visual clips. Teachers' behaviours were subsequently scored by two trained raters over a series of three classroom observations. Results showed that teachers increased their use of all four aspects of autonomy-supportive behaviours compared to their baseline levels. Further, the study revealed that students' engagement was affected by changes in teachers' autonomy support: the more teachers used autonomy support during instruction, the more engaged their students

were. A limitation of this study is the format of the observational grid. Specifically, the grid had a bipolar format according to which each of the four behavioural categories was assessed on a 7-point scale ranging from a controlling to an autonomy-supportive style (e.g., from “relies on extrinsic motivational resources” to “nurtures intrinsic motivational resources”). Such a rating format implies that a decrease in controlling behaviours will necessarily result in equivalent increase in autonomy-supportive behaviours. However, it is plausible that the two dimensions are independent in that, for example, while teachers could become less controlling towards their students they might not necessarily become more autonomy-supportive.

Recent work supports our orthogonality argument (e.g., Barber, 1996; Grolnick, 2003; Silk, Morris, Kanya, & Steinberg, 2003) by showing weak correlations between the two styles. For example, in a study dealing with the relationships between parental psychological control, parental autonomy granting and indicators of adolescents’ psychosocial functioning, Silk et al. (2003) suggested that psychological control is more than the absence of autonomy granting. In other words, the absence of autonomy-support could be displayed via a “neutral” style which does not reflect the will to control people. Thus, to address such concerns, it appears necessary not only to rate autonomy-supportive behaviours independently of controlling behaviours, but also to take into account the neutral communications reflecting the teachers’ will to neither control nor support student autonomy. More precisely, the latter seems to be told in the only intention to facilitate student progress (e.g., “Fold the legs to the landing of the jump you will succeed better”).

The Reeve et al. (2004) study is, however, the only quasi-experimental one that has been conducted in a naturalistic teaching context. Thus, it needs to be replicated, preferably with a different school subject such as PE. In PE, almost all previous studies (e.g., Ntoumanis, 2001; Ntoumanis, 2005; Standage, Duda, & Ntoumanis, 2003) showing a positive link

between teachers' autonomy-support and students' adaptive motivation have used a correlational design with self-report data. In these studies, students were asked to complete questionnaires assessing both teacher motivational strategies and their consequences (e.g., student motivation, effort, learning strategies used, etc.). This exclusive reliance on self-reports can lead to problems of common method variance (i.e., overestimation of construct inter-correlations). In addition, the concurrent assessment of all measures prevents one from making inferences regarding causality links between the variables (Pelletier, Boivin, & Allain, 2000). In other words, whilst it is possible that teachers' greater use of autonomy support can increase students' motivation and engagement in the class, it is also plausible that students' self-determined motivation and active engagement could lead teachers to use autonomy supportive strategies to a greater extent (e.g., Pelletier et al., 2002; Sarrazin et al., 2006; Skinner & Belmont, 1993; Taylor & Ntoumanis, *in press*). Such limitations regarding causal interpretations can be overcome with an experimental design.

Taking into account the limitations previously discussed, the purpose of the present study was to investigate the effects of an experimental programme that aimed to educate PE teachers about autonomy supportive behaviours. Specifically, overt PE teachers' behaviours were coded via an observational grid which distinguished between different categories of teacher communication (i.e., autonomy supportive, controlling and neutral). It was hypothesised that teachers who attended the informational session on how to support student autonomy, would exhibit more autonomy-supportive and less controlling behaviours compared to teachers who did not attend the informational session (Reeve, 1998; Reeve et al. 2004). We did not have a hypothesis as to which of the dimensions of teachers' behaviours would be most influenced by the programme because of the scarcity of empirical evidence. The study by Reeve et al. (2004) is the only one that has coded different teacher behavioural

categories, however, the results of that study might have been influenced by the measured tool employed, which differed from the one we used in our study.

METHOD

Participants

Five PE teachers (3 males and 2 females, ranging in age from 29 to 40 years) and their 96 students (47 females and 49 males from 8th to 12th grade; M age = 14.6 years, SD = 2.29, age range = 12 - 19 years) from two junior high schools situated in the east of France were volunteered to participate to the study. Three teachers (2 males and 1 female) and their 62 students comprised the control group, and 2 teachers (1 male and 1 female) and their 34 students constituted the experimental group.

Although the two schools were located in different school districts, their profiles had many similarities. Specifically, both were urban schools with equivalent size, accommodating students from similar socioeconomic background (i.e., middle-class) and with similar graduation rates. The two samples of teachers also had many similarities. Specifically, both sexes were represented in each group; the teachers had approximately the same amount of experience in their job and taught classes of similar size. Finally, student characteristics which could affect teachers' behaviours, such as age, sex, or level of self-determined motivation, were taken into account in the statistical analysis (see below).

Procedure

In France, PE is a compulsory subject for all high school students. Generally, PE teachers teach each of several physical and sporting activities in 8-week cycles (i.e., 8 lessons of 2 hours). The study was conducted during a gymnastics cycle in scheduled PE lessons. Prior to the commencement of the study, teachers, parents, students and school administrators

were asked to participate in an observational study in which video filming would be used for the purposes of the study only. All participants were guaranteed anonymity. Consent to conduct the study was obtained from the Head Teachers of the schools and the students' parents.

The teachers and their class were randomly assigned to either the experimental or the control condition. Because of the nature of the investigation, the teachers of the control group were not told the purpose of the study nor the specific variables under investigation. Rather, they were told that the researchers were only interested in different types of student behaviour exhibited during PE courses. No reference was made to teachers' interpersonal style. This was a precautionary measure taken to prevent a Hawthorne effect (e.g., Adair, Sharpe, & Huynh, 1989) from influencing teachers' interactions with their students. Because partial deception was employed, appropriate debriefing was carried out following the data collection.

The teachers in the experimental group attended an informational session on how to be autonomy-supportive towards their students. Before the beginning of the cycle, the teachers participated in a seminar which aimed to present the characteristics and consequences of an autonomy-supportive teaching style. The informational session began with a presentation of the basic tenets of self determination theory, including the different types of student motivation (i.e., amotivation, external regulation, introjected regulation, identified regulation, intrinsic motivation), and the different teacher interpersonal styles (i.e., controlling and autonomy-supportive). Further, empirical evidence was presented to support the argument that students benefit when teachers support their autonomy rather than control their behaviour. The characteristics of an autonomy-supportive teacher (i.e., responsive, caring, offering clear advice, choice and initiative taking) were specifically emphasized. After this introduction, group work activities were initiated in order to help each teacher apply these strategies to his/her lessons. Collaborative exercises were used to this purpose.

During the cycle, an individualised guidance programme for each teacher was followed. Specifically, after each lesson the experimenter and the teacher, using video evidence, analysed the teacher's interpersonal style in order to help the teacher improve his/her capacity to support student autonomy. More specifically, this debriefing session aimed to find alternatives to reduce the frequency of directive commands, emphasised the transmission of technical feedback using non-controlling language, helped teachers to better understand the students' point of view, and emphasised the importance of downplaying social comparison.

The teacher-student interactions were videotaped during 6 gymnastics sessions of 2 hours duration using a digital camcorder. The teachers were equipped with a small microphone fixed on the collar of their sweatshirt. We also used a transceiver to allow a precise recording of the content of the communications and the synchronisation between the pictures and the sound. In order not to disturb the teacher and the students, the camcorder was situated in a fixed spot with a large viewing angle, but at a sufficient distance to identify the student(s) implicated in particular interactions. All the classes were filmed during at least one lesson before the beginning of the data collection in order to reduce reactivity effects associated with the use of the camcorder.

As several studies have shown that teachers' behaviours are influenced by student motivation (Pelletier et al., 2002; Sarrazin et al., 2006), we assessed students' initial levels of self-determined motivation during the first lesson of the cycle in order to control the effects of this variable on the teacher-students interactions.

Measures

Students' self-determined motivation in PE. Motivation toward PE was assessed at the beginning of the teaching cycle with a PE version of the Sport Motivation Scale (Pelletier et

al., 1995), and the Academic Motivation Scale (Vallerand et al., 1992). The questionnaire comprised of 28 items and assessed the multifaceted motivational regulations proposed by SDT using 4 items for each regulation (28 items were used in total). The stem of the questionnaire was “I participate in PE because...”. Three subscales assessed three types of intrinsic motivation: to know (IMK; e.g., “for the fun of discovering new skills/techniques”), to accomplish (IMA; e.g., “... for the satisfaction I experience while I am perfecting my abilities”), and to experience stimulation (IMS; e.g., “... for the excitement I feel when I am really involved in the activity”). Three subscales assessed different types of extrinsic motivation: identified regulation (IDR; e.g., “... because what I learn in PE will be useful later”), introjected regulation (INR; e.g., “... because I must do PE to feel good about myself”), external regulation (EXR; e.g., “... because I will be assessed”). One subscale assessed amotivation (AM; e.g., “I don’t know why I participate in PE, if I could, I would get exempted”). Responses were made on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Previous studies (e.g., Sarrazin et al., 2006; Boiché, Sarrazin, Pelletier, & Chanal, *in press*) have provided evidence for the validity and reliability of this scale. In this study, each subscale had adequate internal consistency ($\alpha > .70$), thus the average of the items of each subscale was used for our analysis¹.

In order to reflect the degree of students’ self-determination, the self-determination index was used (see Grolnick & Ryan, 1987; Vallerand & Grouzet, 2001). This index was calculated by assigning each subscale a specific weight according to its respective place on the self-determination continuum. The following formula was used:

$[(2*(IMK+IMA+IMS)/3)+IDR] - [(INR+EXR)/2]+(2*AM)$. In previous studies this index has demonstrated good reliability and predictive validity (e.g., Ntoumanis, 2001; Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002; Vallerand & Bissonnette, 1992; Vallerand & Grouzet, 2001; Vallerand & Losier, 1999).

Overt teachers' behaviours. The observational grid developed by Sarrazin et al. (2006) was used to rate teachers' behaviours. In order to have enough data to compare the two groups, both *frequency* and *type* scores were computed for *each* student implicated in a teacher-student communication. Derived from self-determination theory, and specifically from previous work by Reeve in school settings (Reeve, 2002; Reeve et al., 1999), this grid identifies fifteen categories of verbal interactions: organizational communications (expressed in an autonomy-supportive *vs.* controlling *vs.* neutral way), technical or tactical advice (expressed in an autonomy-supportive *vs.* controlling *vs.* neutral way), posing questions (in autonomy-supportive *vs.* controlling *vs.* neutral), use of praise, encouragement, perspective-taking statements, negative communications (related to a student's discipline in the class *vs.* related to the student's work) and criticisms (see Table 1 for the operational definitions and examples of these 15 categories). The neutral categories were added given the difficulty of classifying some teaching behaviours as controlling or autonomy supportive.

-----Insert Table 1 here-----

Coding reliability and data analysis.

Teachers' behaviours were coded by two trained coders who were not aware of the purpose of the study. Five lessons were randomly selected to estimate inter-rater reliability. To estimate intra-rater reliability, the two coders scored twice the same sample of lessons twice weeks apart. Cohen's kappa coefficients (recommended by Bakeman & Gottman, 1997) revealed a good inter-rater (between .72 to .93; $M = .82$) and intra-rater (between .77 to .96; $M = .85$) reliability for all categories.

The data were first converted in mean frequencies across all lessons for each student. Then, to take into account the missing values for some students, the data were converted into mean frequencies per lesson for each student. Based on previous works (e.g., Reeve, 2002;

Reeve et al., 1999; Reeve & Jang, 2006), 14 of the 15 behaviours were grouped together in 3 overarching categories: (1) autonomy-supportive (i.e., the sum of the mean frequencies of organisational communications, technical and tactical advice, posing questions, encouragements and perspective-talking statements; $\alpha = .66$) ; (2) controlling (i.e., the sum of the mean frequencies of organisational communications, technical and tactical advice, posing questions, criticisms, negative communication related to student's discipline in the class and work; $\alpha = .77$); and (3) neutral (i.e., sum of the mean frequencies of organisational communications, technical and tactical advice, posing questions; $\alpha = .83$). *Praise* was not classified into one of these overarching categories because previous studies have shown that this variable can reflect either autonomy-supportive or controlling behaviours. For example, Deci, Koestner, and Ryan (1999), and Henderlong and Lepper (2002) showed that praise can be perceived as either informational (i.e., it provides the person with information about his/her competence) or controlling (i.e., it conditions a person to engage in a particular behavior). If the informational aspect is salient (e.g., when the teacher says "Good job!"), then praise enhances people's intrinsic motivation. In contrast, if the controlling aspect is salient (e.g., when the teacher says "You did very well, just as you should"), then praise undermines people's intrinsic motivation. The observational grid does not distinguish between these two types of praise because the motivational underpinning of praise is sometimes difficult to rate based on observed behaviours².

RESULTS

Preliminary analysis

The observational procedure described above resulted in the collection of 5027 communications, as summed across all classes. Descriptive statistics (see Table 2) revealed a

prevalence of controlling and neutral behaviours when compared to autonomy supportive behaviours, with differences in the distribution of these three categories between the two groups.

-----Insert Table 2 here-----

With regard to the correlation matrix, the table 3 shown that none of the autonomy supportive behaviours were negatively correlated with a controlling behaviour, and that most of them were not correlated at all with controlling behaviours. This supports the orthogonality argument presented above.

----- Insert Table 3 here-----

Did the informational session have an impact on teachers' behaviours?

Multiple regression analyses were performed to test our hypotheses. The three overarching categories (autonomy supportive, controlling and neutral) and praise communications were regressed on the condition variable (experimental vs. control) and three control variables: students' sex, age and self-determined motivation³. In accordance with Cohen, Cohen, West, and Aiken's (2003) recommendations, control variables were deleted when their effects were not significant and the analyses were rerun.

The results (see Table 4) showed that for all dependent variables, but the controlling style, the effect of the experimental condition was significant. More specifically, the results revealed that compared to the teachers in the control group, those in the experimental group used more autonomy supportive ($\beta=.39; p<.01$) and neutral styles ($\beta=.28; p<.01$), and praised more ($\beta=.92; p<.01$) their students. With regard to the controlling style, there was no significant ($\beta = -.12; ns$) difference between the two groups of teachers. The results also showed that boys received more neutral ($\beta=.29; p<.01$) and controlling ($\beta=.29; p<.01$)

communications, and were more praised ($\beta=.26; p<.01$) than girls; and that young students were more praised ($\beta=-.56; p<.01$) than older ones.

-----Insert Table 4 here -----

DISCUSSION

It is a worrying observation that in the school context students' adaptive motivation decreases as they are getting older (e.g., Otis, Grouzet, & Pelletier, 2005). Among the reasons likely to account for this trend, teacher communication styles play a prominent role (e.g., Turner & Patrick, 2004). Based on the self-determination theoretical framework (e.g., Deci & Ryan, 1985, 2000; Ryan & Deci, 2002), we were particularly interested to study teachers' controlling *versus* autonomy supportive behaviours. Two decades of empirical work on the application of self-determination theory in the educational context, leads to three conclusions (Reeve, 2002): (1) self-determined students thrive in educational settings, (2) students benefit from teachers' provision of autonomy support (see Deci, et al., 1991; Reeve, 2002; Ryan & Deci, 2000, for reviews), and (3) teachers tend to spontaneously use controlling strategies. As similar conclusions can be made about the PE context (Sarrazin et al., 2006), the purpose of this study was to test the efficacy of a training programme intended to make PE teachers aware of the benefits of autonomy supportive behaviours on their students' motivation and behavior. We hypothesized that an informational session underpinned by the basic tenets of self determination theory and their applications, followed by collaborative exercises and a construction of an individualised guidance programme for each teacher, can foster the development of such behaviours in the teaching sessions of the trained teachers.

In accordance with our hypothesis, the results showed that the training programme was successful in helping PE teachers support their students' autonomy. Specifically, teachers in the experimental group, compared to those in the control group, used more frequently an

autonomy supportive style. Four out of five teachers' autonomy supportive behaviours were positively affected by the programme (i.e., organisational communications expressed in an autonomy supportive way, posing questions, encouragement and perspective-talking statements; see footnote 2). These findings are in agreement with those reported by Reeve et al. (2004) who observed teachers of other subjects in the classroom and used a different rating method to code teachers' behaviours. Our rating method counted rigorously each teacher-student interaction and did not really on 7-point Likert scales to code teacher communications.

Nevertheless, contrary to our hypothesis and the findings of Reeve et al. (2004), no differences were observed pertaining to controlling behaviours, apart from marginally less frequent use by the teachers in the experimental group of negative communications related to the students' discipline in the class (see Footnote 3). The divergence between our findings and those by Reeve et al. (2004) can be due to the different observational tool used. Reeve and his collaborators used a bipolar 7-point scale considering autonomy-supportive and controlling behaviours as opposite ends of the same continuum. Thus, in this scale a high score in one style implies automatically a weak score on the other one. However, previous work (e.g., Barber, 1996; Grolnick, 2003; Silk et al., 2003) has shown that autonomy support and control are two independent dimensions. Our results corroborate these findings by showing that providing greater autonomy support will not inevitably decrease a controlling style. How is this possible?

First, it is possible that this result could be due to the content of the training programme. The latter focused mainly on making teachers sensitive to the benefits of providing autonomy support to their students and to a lesser extent on the reduction of controlling behaviours. Secondly, school-related features could account for the lack of decrease in teachers' controlling style. According to Brophy (1999), the school context can

place several demands on the teachers and may lead teachers to cope with pressure by using a controlling style. For instance, Pelletier et al. (2002) have shown that contextual factors – expectations from school authorities or parents, features of the activity taught (e.g., whether they compromise student safety) or class characteristics (e.g., class size, reduced lesson time) – represent pressures for teachers which lead them, in turn, to be controlling toward students. Similarly, other studies (e.g., Pelletier et al., 2002; Reeve, 2002; Sarrazin et al., 2006) have revealed that teachers' personal characteristics – such as their expectations of students, or their lay theories and beliefs about success and the nature of competence – are likely to make them more controlling towards their students. Consequently, it could be difficult for PE teachers to be less controlling towards students when they are worried that the safety of students might be compromised in certain sport activities, the time for lessons is reduced, or when they believe that their students' performance is not up to expected standards.

Based on the aforementioned arguments, the more frequent use of neutral behaviours from the teachers of the experimental group, compared to those of the control group, may be understood as being a compromise for teachers between not undermining their students' motivation and dealing successfully with the constraints of the teaching context. Given that they do not undermine students' motivation, neutral behaviours are less detrimental than controlling ones. Finally, our results show that the teachers of the experimental group praised more their students than those of the control group. Despite the fact that from a conceptual viewpoint praise can be expressed in both autonomy supportive and controlling ways (e.g., Reeve et al., 1999; Reeve & Jang, 2006), this finding implies that in practice teachers use praise as a strategy intended to motivate and energise students' engagement in class.

Limitations and future directions

This work is not without limitations. One such limitation is the non equivalence between the two groups. Even if the units in the two groups shared common characteristics (e.g., schools in terms of size and pass rates, teachers in terms of teaching experience, and students in terms of socio-economic status), it is not known whether the control and experimental groups were statistically equivalent in these characteristics at the beginning of the study. Nevertheless, in order to take into account possible student differences, student self-determined motivation, sex and age were statistically controlled in the analysis. Future research should measure a number of dependent variables before and after an autonomy supportive program to address the equivalence issue.

The sample size constitutes the second limitation of the study. The small number of participants enabled us to set up an individualised guidance programme for the teachers. However, to test the external validity of this work, it would be necessary to increase the number of teachers. In the future, it would be interesting to implement a study on a larger scale without, however, compromising the nature of the intervention.

Finally, it is important to know whether students are sensitive to the change of their PE teacher's behaviours. Our findings showed that the teachers in the experimental group used more autonomy supportive strategies but their use of controlling strategies did not decrease. Do these contradictory styles generate confusion for students? Another interesting question to explore is whether certain types of teacher comments (e.g., controlling statements) might be interpreted by students in light of the teacher's usual style. For instance, objectively controlling statements might not be perceived as highly controlling coming from an autonomy-supportive teacher. Thus, following the example of Reeve et al. (2004) in the classroom domain, testing the effects of an autonomy supportive intervention on students' self-determined motivation and engagement in PE represents an intriguing future research

avenue, particularly in view of the well-established age-related declines in adaptive student motivation patterns.

Lastly, it is important to highlight the implications of our findings for practice and policy. The past proliferation and popularity of research on behaviour modification techniques, such as conditioning, explains why controlling instructional strategies permeate in the teaching community (Kazdin & Bootzin, 1972; Kazdin & Wilson, 1978). In addition, both parents (Boggiano et al., 1987) and students subscribe to the idea that extrinsic incentives are not only desirable, but also optimal motivational tools (i.e., “ the larger the carrot or the stick, the more highly motivated the child”; Boggiano et al., 1987). However, research embedded in the self-determined framework reveals that such beliefs are erroneous (Boggiano et al., 1993). Unfortunately, the belief that controlling instructional strategies are superior to autonomy supportive ones persists in the mind of practitioners even after they are exposed to disconfirming evidence (Boggiano et al., 1987). Clearly, it is important to continue educating teachers about the benefits (and superiority) of autonomy supportive instructional strategies. Our results reveal that making PE teachers aware of the benefits of an autonomy supportive style can foster the use of these strategies in PE settings.

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Footnotes

1. Integrated regulation was not assessed in the present study because pilot data collected during the development of the SMS (Pelletier et al., 1995) revealed that this regulation did not emerge as a perceived reason for participation in the physical domain. Furthermore, this type of motivation is more often encountered among adults rather than children (Vallerand, 1997).

2. As suggested by a reviewer, encouragement (like praise) could also be used in a controlling way. In fact, in a pilot version of the grid, we had added a supplementary category which permitted the raters to identify ambiguous communications such as controlling encouragement. No such instances were identified by the raters and, thus, in the main study this supplementary category was abandoned. Further, in the most recent study on this topic (Reeve & Jang, 2006) it was shown that encouragement intended to boost or sustain student engagement (such as the type of engagement rated in our study) had the highest correlation with perceived autonomy, when compared to other behaviours (Table 3, p. 214). In contrast, in the same study praise used as an informational tool versus as contingent reward was positively and negatively, respectively, correlated with perceived autonomy.

3. Additional analyses were carried out testing each type of verbal interaction individually. Significant differences were found in 1) the organisational communications expressed in a autonomy-supportive ($\beta=.25, p<.05$) and neutral ($\beta=.26, p=.01$) way; 2) the technical or tactical advice expressed in a neutral way ($\beta=.52, p<.05$); 3) questions expressed in an autonomy-supportive ($\beta=.35, p<.001$) and neutral ($\beta=.45, p<.001$) way; 4) encouragement ($\beta=.27, p<.05$); 5) perspective-talking statements ($\beta= .34, p<.01$); and 6) negative communications related to the students' discipline in the class ($\beta= -.66, p<.01$).

Table 1. *Types of Coded Verbal Interactions (Derived from Sarrazin et al., 2006)*

Types of verbal interactions	Definitions	Examples
1. Organizational communications expressed in		
a controlling way	Frequency of organizational commands stating that a student must, have, or ought to do something.	“You must move into the left-hand line”
a neutral way	Frequency of organizational statements for which the tone is neither controlling nor autonomy-supportive.	“Bring the springboard please”
an autonomy-supportive way	Frequency of statements that communicate a choice in the organization of the material.	“You can choose the group you want to join”
2. Technical or tactical hints expressed in		
a controlling way	Frequency of technical or tactical directives that impose a motor task on a student.	“Extend yours arms, I have told you that 10 times”.
a neutral way	Frequency of technical or tactical statements for which the tone is neither controlling nor autonomy-supportive; the intention is primarily to facilitate student progress.	“Fold the leg to the landing of the jump you will succeed better”.
an autonomy-supportive way	Frequency of suggestions that encourage students to take initiatives and to solve problems independently.	“Maybe you could try different positions to jump over this obstacle and then choose the best”.
3. Questions expressed in		
a controlling way	Frequency of directives posed as a question.	“What have I just said?”
a neutral way	Frequency of questions for which the tone is neither controlling nor autonomy-supportive.	“Is it your last try?”
an autonomy-supportive way	Frequency of questions that provide choices to students.	“Which exercise do you want to start with?”
4. Praise	Frequency of verbal approval of a student’s performance.	“Well done!”, “good job!”
5. Encouragements	Frequency of pep-talk statements to boost a student’s effort	“Now you’re getting the hang of it; let’s go!”
6. Perspective-talking statements	Empathic statements reflecting an understanding of a student’s perspective.	“I can see that you are starting to get tired”
7. Negative communications related to		
students’ discipline in the class	Frequency of directives intended to restore discipline into the classroom.	“Shut up!”

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student 's work	Frequency of directives meant to emphasise the lack of effort; these directives could be sarcastic.	“Do not do too much, you will wear away the apparatus!”
8. Criticisms	Frequency of hurtful statements.	“You are completely numskull!”

Table 2. *Descriptive Statistics of all Behavioural Variables*

Behaviours	Control Group (<i>n</i> = 62)		Experimental Group (<i>n</i> = 34)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1. Organizational communications expressed in a controlling way	1.26	1.80	1.53	2.26
2. Organizational communications expressed in a neutral way	1.15	1.41	1.88	1.51
3. Organizational communications expressed in an autonomy-supportive way	0.10	0.20	0.19	0.28
4. Praise	1.21	2.84	4.58	3.57
5. Encouragement	0.80	1.21	1.53	1.51
6. Questions expressed in an autonomy-supportive way	0.11	0.25	0.63	1.09
7. Questions expressed in a neutral way	0.77	1.28	2.65	1.99
8. Questions expressed in a controlling way	0.71	1.12	0.18	0.34
9. Technical or tactical advice expressed in an autonomy-supportive way	0.17	0.36	0.3	0.35
10. Technical or tactical advice expressed in neutral way	2.79	5.05	5.24	3.85
11. Technical or tactical advice expressed in a controlling way	1.59	2.51	1.37	1.41
12. Criticism	0.03	0.14	0	0
13. Negative communications related to a student's discipline in the class	0.39	0.77	0.40	0.68
14. Negative communications related to a student's work	0.58	0.99	0.24	0.64
15. Perspective-talking statements	0.03	0.14	0.28	0.63
Teaching Styles (Underlying behaviours in brackets)				
Autonomy supportive (3+5+6+9+15)	1.20	1.49	2.94	2.63
Controlling (1+8+11+12+13+14)	4.56	5.86	3.72	4.03
Neutral (2+7+10)	4.72	6.93	9.78	6.47
Self-Determined Motivation	2.85	6.43	3.83	5.57

Note. Each behaviour is coded in mean frequency by student and by lesson (i.e., 2 hours).

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Table 3. *Correlation Matrix of all Measured Variables*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Organizational C	-														
2. Organizational N	0.42**	-													
3. Organizational AS	-0.02	0.39**	-												
4. Praise	0.43**	0.58**	0.24*	-											
5. Encouragement	0.47**	0.67**	0.19	0.46**	-										
6. Question AS	0.08	0.38**	0.41**	0.33**	0.21*	-									
7. Question N	0.31**	0.59**	0.40**	0.56**	0.51**	0.15*	-								
8. Question C	0.53**	0.41**	-0.03	0.17	0.33**	-0.14	0.12	-							
9. Technical AS	0.23*	0.12	0.12	0.22**	0.35**	0.11	0.30**	0.11	-						
10. Technical N	0.54**	0.66**	0.22*	0.77**	0.59**	0.10	0.58**	0.38**	0.26**	-					
11. Technical C	0.46**	0.57**	-0.06	0.50**	0.59**	-0.06	0.34**	0.61**	0.11	0.72**	-				
12. Criticism	0.24*	-0.07	-0.04	0.23**	0.01	-0.04	-0.10	0.19	0.29*	0.08	0.10	-			
13. Negative student behaviour	0.55**	0.19	0.17	0.12	0.21*	0.20*	0.05	0.20*	0.21*	0.09	0.03	0.12	-		
14. Negative student work	0.66**	0.36**	-0.11	0.30**	0.34**	-0.14	0.27**	0.68**	-0.02	0.55**	0.61**	0.04	0.16*	-	
15. Perspective talking statements	0.16	0.41**	0.33**	0.50**	0.39**	0.02	0.56**	-0.03	0.28*	0.49**	0.19	-0.03	0.11	0.06	-
16. Student initial motivation	-0.13	-0.15	-0.06	-0.03	-0.11	-0.06	-0.11	-0.04	0.02	-0.07	-0.02	0.12	-0.24*	0.00	-0.10

Note. C = Controlling, N = Neutral, AS = Autonomy-Supportive.

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

Table 4. *The Effects of the Autonomy Support Educational Programme on PE Teachers' Interpersonal Style*

	AS style		Neutral style		Controlling style		Praise	
	β	t	β	t	β	t	β	t
	$F(1,94) = 17.04;$ $p < .000;$ $R^2 = .14$		$F(2,93) =$ $11.28; p < .000;$ $R^2 = .18$		$F(4, 91) = 2.24;$ $p < .07;$ $R^2 = .05$		$F(3, 92) =$ $13.76; p < .00;$ $R^2 = .28$	
Age	-	-	-	-	-.01	-.04	-.56	-2.37*
Sex	-	-	0.29	3.04**	.29	2.74**	.26	2.97**
Self-determined motivation	-	-	-	-	.00	0.009	-	-
Condition (control vs. experimental)	.39	4.13**	.28	2.95**	-.12	-.46	.92	3.97**

Note. AS = Autonomy Supportive. * $p < .05$, ** $p < .01$. Empty cell means that the control variable was deleted of the analyze because its effect was not significant (in accordance with Cohen, Cohen, West, and Aiken's (2003) recommendations). For the controlling style, all the variables are report because the variable condition is not significant.