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Effects of an autonomy-supportive intervention on tutor behaviors in a higher education context

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ABSTRACT

Empirical evidence has attested to the benefits of autonomy support in a classroom context, in facilitating students' autonomous motivation, well-being, creativity, engagement, and persistence. However, most interventional research aiming to increase teachers' autonomy-supportive behaviors has been conducted in school and college contexts, with few studies aimed at university tutors. The current study implemented a brief theory-driven autonomy-supportive intervention in university seminars and developed an observational checklist instrument to assess behavior change. Tutors who received brief training in autonomy-supportive teaching techniques showed significant increases from baseline in two important autonomy-supportive behaviors in their classes. Potential implications and suggestions for further development of the intervention are discussed.

1. Introduction

Research in the educational domain has shown that the nature of students' motivation, in addition to its intensity, is fundamentally important in determining well-being, persistence, and achievement-related outcomes (e.g., high grades and attainment) (e.g., Black & Deci, 2000). Empirical studies have documented a range of benefits of motivational interventions for school and college students, including engagement with learning material (Reeve, Jang, Carrell, Jeon, & Barch, 2004), depth of processing, test performance, and persistence in educational tasks and work (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004). However, there is a dearth of literature exploring the effects of such interventions within higher education and university contexts. It is important that motivational interventions are developed for university students, particularly as university provides a very different learning context to the environment in educational institutions with which students were previously familiar (e.g., schools and colleges) and students may therefore require extra support to ensure that their motivation remains high and dropout is prevented.

1.1. Self-determination theory and motivational interventions in education

Many motivational interventions implemented within educational contexts have been grounded in a macro theory of human motivation, known as self-determination theory (SDT; Deci & Ryan, 1985, 2000). Self-determination describes a state in which one's behavior is endorsed by the self at the highest level of reflection and a sense of freedom to engage in activities that are interesting, personally-valued, and vitalising is experienced (Deci & Ryan, 1985). One of the key postulates of SDT is that humans are innately predisposed towards the mastery of challenges and psychological growth, but that these processes require the satisfaction of three fundamental psychological needs for autonomy, competence, and relatedness (Ryan & Deci, 2000). SDT also proposes a broad distinction between intrinsic and extrinsic motivation, which is particularly pertinent to the need for autonomy, or the desire to experience behavior as self-initiated and self-regulated (Deci & Ryan, 1985, 2000). Intrinsic motivation supports autonomy and is characterised by engaging in behavior for the sake of the behavior itself and for the outcomes of enjoyment, satisfaction, and fulfilment. Extrinsic motivation is evident when behavioral engagement is driven by factors external to the self, such as gaining social approval and avoiding punishment. Deci and Ryan also differentiate between four types of extrinsic motivation: integrated, identified, introjected, and external regulation. These forms of behavioral regulation are situated on a continuum that extends from intrinsic motivation to external regulation.

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Movement along the continuum of behavioral regulation from extrinsic to intrinsic motivation is enabled through the process of internalisation, in which an activity or behavior is gradually assimilated to the self, to become consistent with existing values and goals. Integrated regulation represents the most internalised form of extrinsic motivation, whereby behavior becomes compatible with one's values, goals, and aspirations.

Determining the quality of motivation underlying behavior is critically important, as the various types of behavioral regulation described by Deci and Ryan (1985, 2000) incur different consequences on behavioral quality, persistence, and well-being. Intrinsic motivation is consistently associated with more effective learning, stronger engagement in behaviors and tasks, higher quality performance, greater behavioral persistence, and superior psychological health, relative to extrinsic motivation. The systematic differences between outcomes of intrinsic and extrinsic motivation have emerged across a variety of domains, including education, work, and health (Assor, Kaplan, Kanat-Maymon, & Roth, 2005; Edmunds, Ntoumanis, & Duda, 2008). It is therefore highly desirable to foster intrinsic motivation in students, in order to maximise their productivity and achievement potential and to ensure their well-being.

Ryan and Deci (2000) emphasise the importance of social context in facilitating the satisfaction of the aforementioned fundamental needs and distinguish between two types of environment that are likely to influence need satisfaction. First, autonomy-supportive environments acknowledge the perspective of the individual and empower them with a sense of choice over their behavior. This type of environment is likely to promote self-determined or autonomous motivational states and psychological need satisfaction. Second, controlling environments indicate to the individual that the control over their behavior is likely to emanate from outside the self and as such is not congruent with the need to be the origin of one's actions. Such environments lead individuals to experience conflict and pressure, likely reduce self-determined or autonomous motivational states, and thwart the satisfaction of psychological needs.

As studying behavior is unlikely to be intrinsically motivated, it is important to implement support for students' autonomy in their educational environment, in order to facilitate a process of internalisation. Deci, Eghrari, Patrick, and Leone (1994) found that three contextual factors are necessary for developing an autonomous motivational style and promoting internalisation, namely provision of a meaningful rationale, acknowledging the actor's feelings, and conveying a sense of choice. Deci and colleagues argued that the absence of two of these factors from the environment is likely to reduce autonomous motivation and can lead to maladaptive behavioral and psychological outcomes. These factors have been utilised in the development of autonomy-supportive techniques, which aim to nurture individuals' inner endorsement of their activities. The provision of autonomy support has been associated with well-being, behavioral quality, and persistence across a range of domains. Empirical evidence has shown that students with autonomy-supportive teachers experience greater autonomy and more positive functioning in terms of classroom engagement, emotionality, creativity, intrinsic motivation, psychological well-being, conceptual understanding, academic achievement, and persistence in school relative to students with controlling teachers (e.g., Hardre & Reeve, 2003). Interventions to increase teachers' autonomy support in the classroom have also yielded encouraging results in terms of improving the learning, persistence, and achievement outcomes of students (e.g., Vansteenkiste et al., 2004). Similar findings have been obtained for health-related behavior in improving adherence and promoting more effective self-regulation (Hagger, Wood, Stiff, & Chatzisarantis, 2009). Chatzisarantis and Hagger (2009), for example, showed that the implementation of an autonomy-supportive style within physical education increased both students' intentions to engage in leisure-time physical activity and their actual physical activity participation. The beneficial effects of autonomy support have also been established as stable across different cultures (e.g., Chirkov & Ryan, 2001).

1.2. Modification of teachers' behaviors to support students' autonomy

Autonomy-supportive interventions have illustrated that it is possible to modify instructors' autonomy-supportive behaviors through training. For instance, Reeve (1998) successfully increased the autonomy-supportive behaviors of a sample of preservice teachers through an intervention based on a training workbook, but found that teachers who were autonomy-oriented assimilated the information more easily than those who were control-oriented. Reeve et al. (2004) also showed that teachers who received training in autonomy-supportive methods increased their autonomy-supportive behaviors from baseline measures, as assessed by rater observation. Interventions have also demonstrated the feasibility of manipulating instructors' behaviors in physical activity and physical education contexts to become more autonomy-supportive through SDT-based training (e.g., Edmunds et al., 2008; Tessier, Sarrazin, & Ntoumanis, 2008). However, the interventions in the academic domain have exhibited some methodological limitations. Reeve's (1998) findings were based on teachers' self-reports of their autonomy-supportive behavior which could have introduced the problem of social desirability bias. Reeve et al.'s. (2004) intervention adopted four broad bipolar category descriptors with a seven-point rating scale for behavioral assessment that did not fully encompass all potential autonomy-supportive behaviors. Consistent with the continuum of behavioral regulation postulated by Deci and Ryan (1985), teachers may fall anywhere between being autonomy-supportive and controlling, dependent upon their levels of each type of behavior. For example, Roth, Assor, Kanat-Maymon, and Kaplan (2007) found support for the existence of a continuum of relative autonomy for teaching, and teachers' positions on this continuum were significantly related to students' perceptions of them as autonomy-supportive. Further, Reeve (1998) did not provide full details of the autonomy-supportive instructional strategies that participants were exposed to, and the range of autonomy-supportive behaviors assessed in Reeve et al. (2004) study was not comprehensive.

As the majority of this research has employed teachers of school and college students, the present intervention aimed to assess whether a brief SDT-based autonomy-supportive intervention was effective in changing tutors' behaviors to become more autonomy-supportive within a university teaching context. The intervention also aimed to extend previous research in the area by targeting a comprehensive set of autonomy-supportive behaviors identified empirically by Reeve and Jang (2006) as supporting students' autonomy, and incorporating both verbal and non-verbal autonomy-supportive and controlling behaviors, in contrast to the training provided in previous interventions (e.g., Tessier et al., 2008). The training provided within the intervention was also of a briefer nature than that adopted in previous studies (e.g., Reeve et al's., 2004), to determine the efficacy of a short and less intrusive training programme to change tutors' behavior. Further, this research endeavoured to develop a more accurate and reliable system of evaluating the fidelity of our intervention to change tutors' autonomy-supportive behavior than those employed previously, through obtaining precise individual ratings for specific behaviors. Through behavioral observation and systematic recording we expect to avoid the potential for social desirability

problems associated with the use of self-report measures. This intervention therefore aimed to both extend the application of self-determination theory to a university teaching intervention context and to provide a model for behavior change that could be applied to facilitate autonomy-supportive teaching across a range of settings. For example, teachers could implement these techniques within their everyday lessons, and educators of teachers could also use the model to inform teachers of how to become more autonomy-supportive. It was hypothesised that tutors who received the SDT-based autonomy support training would significantly increase the level of autonomy support delivered to students from baseline, across a series of three seminars. Specifically, it was predicted that these tutors would demonstrate a significant increase in the autonomy-supportive behaviors targeted for change, such as the use of encouragement, and a significant reduction in the controlling behaviors that they were asked to reduce, for instance by avoiding the use of directives and commands. These changes were assessed through the use of the systematic observational checklist system. No changes in autonomy-supportive or controlling behaviors were expected in the control tutors. It was also hypothesised that the tutors who received training would self-report significantly increased perceived autonomy support (PAS) for their students over time. No such differences in PAS were expected in the control tutors.

2. Method

2.1. Participants

Nine postgraduate tutors were recruited into the study from one UK University, through volunteer sampling. The sample consisted of two males and seven females, with a mean (SD) age of 26.44 (3.75) years. The tutors had a mean (SD) level of teaching experience of 13.94 (16.93) months. Seven of the tutors led seminars in Psychology, one tutor led seminars in Statistics, and one tutor delivered seminars in Film Studies.

2.2. Design

The study employed a prospective experimental intervention design, with three waves of data collection. Baseline behavioral data was collected at time 1, followed by post-interventional data at times 2 and 3. Each wave of data collection was separated by a two-week interval.

2.3. Measures

2.3.1. Behavioral assessment

A list of target behaviors to be modified in the experimental tutors was developed on the basis of the autonomy-supportive behaviors documented by Reeve and Jang (2006). Those behaviors that Reeve and Jang reported to account for significant unique variance in students' perceived autonomy support were categorised as "primary autonomy-supportive behaviors", as these were viewed as those behaviors most important in delivering autonomy-supportive teaching. Those that had only been established as significantly associated with students' perceived autonomy support were classed as "secondary autonomy-supportive behaviors". The primary behaviors included provision of a meaningful rationale, defined as providing students with a personally meaningful explanation for what they are doing, the amount of time students spent talking in class, and the frequency of encouragements offered to boost or sustain students' engagement. Examples of the secondary behaviors include avoidance of directives and commands in engaging students in a task, acknowledgement of the students' perspective through empathic statements, and the offering of hints on how to make progress when students encountered difficulties. A full list of these behaviors, with details of their operationalisation, can be found in Table 1. This list was used in the training of the tutors and also served as an observational checklist for assessing the fidelity of the experimental tutors to the intervention during the seminars.

2.3.2. Perceived autonomy support

A self-report measure of PAS was also developed for the tutors, using the fourteen primary and secondary behaviors from the checklist as items. This measure was intended to reflect the degree to which tutors felt that they were implementing autonomy support within their classes. Tutors were asked to express the extent to which they exhibited each of the autonomy-supportive and controlling behaviors, using a four point Likert scale with the anchors *not true at all* (1) and *very true* (4). Items included "I offer my students encouragement while they are working on tasks",

Table 1
The behaviors from the observational checklist and their operationalisation.

Behavior	Operationalisation
Primary behaviors	
Offering encouragements	Frequency of statements to boost or sustain the students' engagement, such as "Almost" and "You're close"
Time allowing the student to work in their own way	Cumulative number of seconds the tutor invited or allowed the students to work independently and engage in the task in their own way
Time the students spend talking	Total length of utterances from students, measured in seconds
Avoid asking controlling questions	Frequency of directives posed as a question and voiced with the intonation of a question, such as "Why don't you go ahead and tell me?"
Avoid making "should"/"got to" statements	Frequency of statements that the students should, must, have to, have got to, or ought to do something
Providing a meaningful rationale	Providing students with a personally meaningful explanation for what they are doing
Secondary behaviors	
Time spent listening	Frequency with which the tutor carefully and fully attended the students' speech, as evidenced by the number of verbal and non-verbal signals of active, contingent and responsive information processing
Praise as informational feedback	Frequency of statements to communicate positive effectance feedback about the students' improvement or mastery, such as "Good job" and "That's great"
Offering hints	Frequency of suggestions about how to make progress when the student seems stuck
Being responsive to student-generated questions	Frequency of contingent replies to a student-generated question or comment, such as "Yes, you're right" and "Yes, you have a good point"
Making perspective-acknowledging statements	Frequency of empathic statements to acknowledge the student's perspective or experience, such as "Yes, this is difficult"
Minimise time spent holding/monopolising learning materials	Cumulative number of seconds that the tutor physically holds or possesses learning materials
Avoid uttering solutions/answers	Number of solutions or answers the tutor provides before the student has the opportunity to discover the answer for himself or herself
Avoid uttering directives/commands	Frequency of directing (in a controlling manner) or commanding students to engage in a task

"I make statements that show empathy with my students and demonstrate that I can see things from their point of view", and "I frequently tell my students that they *should, must* or have *got to* do something". Items reflecting controlling behaviors, such as the latter item, were reverse-scored such that higher scores reflected greater autonomy support. Demographic data on gender, age and number of months of teaching experience were also requested from the tutors.

2.4. Procedure

The intervention protocol was approved by the ethics committee of a large University within the UK. Tutors were allocated to either the experimental or control condition through a random number generator (http://www.randomizer.org). This resulted in five tutors being allocated to the experimental condition and four tutors being allocated to the control condition. Each tutor conducted three seminars, the first of which served as a pre-interventional baseline measure. Two observers unobtrusively recorded behaviors using the observational checklist in each tutor's first seminar and distributed a questionnaire at the end of the session, which contained the demographics questions and the PAS measure.

Following baseline measures, experimental tutors attended two standardized twenty-minute training sessions, with a one-week interval between them. These were group training sessions, so all five tutors attended collectively. The initial session was broken down into four components. Initially, approximately five minutes was spent on presenting the key concepts of self-determination theory. Particular focus was given to the distinction between intrinsic and extrinsic motivation and the role of autonomy support in enabling individuals to become more intrinsically motivated. Autonomy support was described as contextual support that aided students' perception of themselves as the originator and regulator of their behavior. Tutors were informed that autonomy support within the classroom referred to teaching in ways that foster self-determined motivation and help students to endorse their own classroom activities. Next, approximately five minutes was devoted to presenting the benefits of providing autonomy support to students. Examples of empirical evidence were presented, including laboratory and intervention studies that have shown that students with autonomy-supportive teachers experience greater autonomy and more positive functioning in terms of classroom engagement, emotionality, creativity, intrinsic motivation, psychological well-being, conceptual understanding, academic achievement and persistence in school relative to students with controlling teachers (e.g., Black & Deci, 2000; Grolnick & Ryan, 1987; Hardre & Reeve, 2003). Following this, five minutes were spent outlining the behaviors that tutors were asked to modify to become more autonomy-supportive. Tutors were informed that the primary behaviors were of paramount importance, but that they should try to implement as many of the secondary behaviors as possible. As tutors were provided with written materials reinforcing all information introduced within the training session, including details of the target behaviors, the behaviors were presented and described briefly. The behaviors were also to be the focus of the second training session. The remaining quarter of the session was used to answer tutors' questions about the intervention and to reinforce the information presented. Following each component of the session, researchers ensured that the tutors expressed comprehension of the information. At the end of the session, tutors were asked to read the materials that they had been given before the second training session, in order to consolidate their learning. In the second session, a brief summary of the previous session was delivered, followed by an outline of the target behaviors. Tutors were then asked to demonstrate how to put each of the behaviors into practice within a classroom setting, to ensure that they were able to implement the required changes to their teaching practice. Feedback was provided to tutors in an autonomy-supportive manner and additional suggestions for implementing the target behaviors were offered. Finally, the remaining few minutes of the session were used to remind tutors to try their best to maintain these behavioral changes within their teaching sessions and for any contact without students outside the seminar context, for example via electronic mail correspondence.[1] The control tutors received equal contact time with the researchers in their attendance at two group discussion sessions, each of twenty minutes' duration. In these sessions, tutors were asked about their opinions on effective teaching methods, techniques that students could use to maximise their learning, and the best ways of conveying information to students. A full list of the discussion questions used with the control tutors is presented in Table 2. Tight controls were put in place to ensure that the motivational content did not transfer from the intervention training sessions to the discussion sessions with the control group. Control tutors were not informed that they were participating in an intervention study and no references were made to self-determination theory, autonomy support or motivation. The researchers emphasised their interest in students' behaviors within the classroom setting, in order to avoid the problem of demand effects from these tutors. Several of the questions also focused solely on student behavior, to prevent over-implicating the tutors in the students' motivation and learning.

Observers attended the second and third seminars of each tutor to record autonomy-supportive behaviors and assess the fidelity of tutors to the intervention manipulations, and to administer questionnaires containing the PAS scale. With the tutors' and students' consent, five of the seminars were videotaped, to gain data for inter-rater reliability analyses. Two independent observers recorded the autonomy-supportive behaviors from the videotaped seminars and this data was subjected to inter-rater reliability analysis with the data recorded by the main observers. Tutors were fully debriefed regarding the purposes and hypotheses of the study, after delivering their third seminar. At debriefing, the control and experimental tutors were asked about their familiarity with self-determination theory prior to the intervention and indicated that they had not been familiar with the concepts and ideas introduced.

2.5. Data analysis

All observational data was averaged between raters for each class, to obtain mean values for the tutor behaviors. Tests of homogeneity of variance and normality of distribution were conducted for the behavioral data and the PAS for each wave of data collection. Levene's test supported the homogeneity of variance between groups for all but one case, while the Kolmogorov–Smirnov test indicated that data were normally distributed in all cases except four. In cases in which small deviations from normality were observed, ANOVAs were still conducted as this analysis is robust to deviations from normality (Field, 2005). Change in PAS was calculated between each wave of data collection and one-way ANOVAs were used to determine whether the two groups exhibited significantly different patterns of change in this variable across the intervention. Mixed model ANOVAs were employed to assess whether interactions between experimental condition and wave of data collection were present for the objectively-measured autonomy-supportive behaviors. Independent- and related-samples *t*-tests were used to probe significant

[1] Full details of the instructions given to the experimental tutors and the training sessions are available from the first author on request.

Table 2
Discussion questions used with the control tutors.

Session 1: Teaching experiences and methods
1. What kind of teaching methods do you employ in your classes? Can you give examples?
2. How do you try to engage your students?
3. How do you think you can help students to learn effectively?
4. What do you feel are the biggest challenges you face in your teaching?
5. What do you think is the best way of conveying information to your students, e.g., visual, verbal?
6. How do you take account of the possibility that your students may have differing levels of knowledge and may learn at different rates?
Session 2: Student behavior and learning
1. What do you think students feel are good qualities for a tutor to have?
2. How do you think students can maximise their learning?
3. How do you think you can facilitate your students to work effectively outside the classroom environment?
4. What student behaviors do you think obstruct their learning experience in class?

interaction effects and main effects of time. For the dichotomous provision of rationale variable, chi-square analyses were employed to test for significant differences between the two groups of tutors.

3. Results

3.1. Preliminary analyses

3.1.1. Internal reliability of PAS

The PAS demonstrated good internal reliability, $\alpha = .89$.

3.1.2. Teaching experience

An independent-samples *t*-test indicated that there was no significant difference in teaching experience between the experimental and control tutors.

3.1.3. Inter-rater reliability

Inter-rater reliability analyses were conducted, in order to assess the reliability of the observational checklist system for recording behavior. The behavioral data were divided into three classes for these analyses: dichotomous variable, time data, and frequency data. For the dichotomous variable, there was 100% agreement between the four raters across the seminars. Intraclass correlations of .99 and .97 were obtained for the time and frequency data, respectively, indicating high inter-rater reliability.

3.2. Main analyses

3.2.1. Self-report PAS data

A borderline significant difference emerged between groups for the change in PAS between waves 2 and 3 of the intervention, $F\ (1,\ 7) = 5.15$, $p = .057$. Descriptive statistics revealed that the experimental tutors exhibited an increase in PAS between waves 2 and 3, mean (standard deviation) change score = .10 (.08), while the control tutors reduced their PAS over this time, mean (standard deviation) change score = −.13 (.21).

3.2.2. Main effects for behavioral data

Significant main effects emerged for two of the autonomy-supportive behaviors. Means and standard deviations for these behaviors are presented in Table 3. There was a significant main effect of time for frequency of perspective-acknowledging, $F\,(2, 14) = 12.69$, $p < .01$, partial $\eta^2 = .65$. Post hoc related-samples *t*-tests indicated that there were significant increases in the mean frequency of perspective-acknowledging statements between waves 1 and 2, $t\,(8) = -3.34$, $p = .01$, and between waves 1 and 3, $t\,(8) = -3.62$, $p < .01$. A main effect of condition was determined for the frequency with which tutors showed signals of carefully and fully attending to the students' speech, $F\,(1,7) = 9.11$, $p < .05$, partial $\eta^2 = .57$. Control tutors displayed significantly more signs of carefully and fully attending to the students' speech than experimental tutors.

3.2.3. Interaction effects for behavioral data

Significant interaction effects between wave of the intervention and experimental condition were determined for two of the autonomy-supportive behaviors. Means and standard deviations for these behaviors can be found in Table 3 and the interaction effects are shown in Figs. 1 and 2. The first interaction effect was for the primary autonomy-supportive behavior of amount of time that students spent talking in class, $F\ (2,14) = 5.35$, $p < .05$, partial $\eta^2 = .73$. Post hoc tests revealed that the significant difference in the amount of time that students spent talking in class between the control and experimental tutors at the pre-interventional wave of data collection, $t\ (7) = 4.07$, $p < .01$, was eliminated by the second and third waves. Although non-significant, there was a trend towards an increase in this variable between waves 1 and 3 of data collection for the experimental tutors, $t\ (4) = -2.59$, $p = .06$. At the pre-intervention stage, students of the control tutors spent significantly more time speaking in class than those of the experimental tutors at this stage. In contrast, by the second follow-up phase, the students of experimental tutors spent more time speaking in class than the control tutors' students. The second interaction effect to emerge was for the secondary behavior of directives and commands given by the tutor, $F\ (2,\ 14) = 9.53$, $p < .01$, partial $\eta^2 = .58$. This represented a controlling behavior and was therefore one of the behaviors that experimental tutors were asked to avoid. Independent-samples *t*-tests indicated that there were no significant differences in frequency of directives and commands uttered by the tutors at the first or second phase of data collection. However, at the third wave, experimental tutors were using significantly fewer directives and commands than control tutors, $t\ (7) = 3.28$, $p < .05$. Further, related-samples *t*-tests showed that there were significant decreases in the frequency of directives and commands used by the experimental tutors between the first and second waves of the intervention, $t\,(4) = 3.35$, $p < .05$, and between the first and third waves, $t\,(4) = 4.32$, $p < .05$. Mean scores showed that the experimental tutors demonstrated a significant reduction in the number of directives and commands used in seminars over the course of the intervention, while control tutors displayed an increase in this behavior.

4. Discussion

The present study aimed to assess the efficacy of a comprehensive yet brief intervention based on self-determination theory in modifying the autonomy-supportive behavior of postgraduate tutors in a university context. Experimental tutors received two short standardized training sessions in SDT, autonomy support and methods of changing their teaching delivery to become more supportive of the autonomy of their students. Control tutors attended two discussion sessions, in order to receive equal contact time with the instructors as the experimental tutors, but no training was provided for this group. Results indicated that the intervention was moderately successful in changing behavior, with significant changes and large effect sizes in the desired direction emerging for the experimental tutors in two of the behaviors. Experimental tutors increased their facilitation of students speaking in class between the first and third phases of the intervention and exhibited significant decrements in their use of

Table 3
Means (standard deviations) for the autonomy-supportive behaviors for which significant main and interaction effects were determined.

	Experimental condition					
	Experimental			Control		
Behaviour	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
S1[a]	5.35 (7.86)	10.51 (7.91)	18.25 (8.60)	18.44 (5.91)	21.38 (7.52)	15.13 (11.07)
S5[b]	.40 (.55)	1.00 (.61)	1.15 (.34)	.31 (.47)	1.00 (.91)	2.06 (1.05)
P3[c]	47.50 (55.57)	155.13 (115.18)	179.50 (86.29)	265.91 (104.05)	197.78 (104.85)	99.22 (39.49)
S8[d]	2.35 (1.24)	.75 (1.27)	.20 (.27)	.88 (1.18)	.75 (.87)	2.31 (1.43)

[a] S1 = frequency of signals that tutor was carefully and fully attending to students' speech.
[b] S5 = frequency of perspective-acknowledging statements from tutors.
[c] P3 = time students spent talking in class (seconds).
[d] S8 = frequency of directives and commands uttered by tutors.

controlling directives and commands between phases 1 and 2, and phases 1 and 3. Importantly, results have indicated that it is possible to increase autonomy-supportive behaviors and decrease controlling behaviors in tutors using a brief intervention. Although many autonomy-supportive behaviors from Reeve and Jang's taxonomy were not significantly changed in the experimental tutors, two important behaviors were modified through a brief forty-minute training intervention across two sessions. These results are promising, particularly in view of the brief nature of the intervention. It is possible that the behaviors that did not change were more difficult for the tutors to monitor and modify, so further training and greater opportunity to put the behavior change into practice could have resulted in changes in these other behaviors. The present study also provides a useful system for autonomy-supportive behavioral modification that could be utilised in other domains. Inter-rater reliability analyses supported the observational checklist as a reliable instrument for recording autonomy-supportive and controlling behaviors and aided the assessment of intervention fidelity. In doing so, the present intervention has met the need for clear and standardized intervention protocol, emphasised by Abraham and Michie (2008), which has not been reported as standard in previous interventions in this field. The intervention protocol and rigorous methods used in the development of the behavioral assessment checklist will ensure that the intervention can be conducted accurately in replications and further applications. This research has also provided an exemplar of the importance of adopting treatment fidelity protocols when evaluating interventions of this type.

In comparison to previous autonomy-supportive interventions, the present study was ambitious in the comprehensive set of behaviors targeted for change. Previous autonomy-supportive interventions have focused largely on the three core components of autonomy support, namely provision of choice and a meaningful rationale from figures of authority, and acknowledgement of the perspective and feelings of others, while minimising pressure (Deci et al., 1994). In contrast, the behavioral manipulations implemented in the present intervention focused on a wider range of behaviors, which were based on theory and previous empirical evidence (Reeve & Jang, 2006). Furthermore, while previous interventions have tended to direct efforts towards verbal communications only (e.g., Tessier et al., 2008), the range of behaviors targeted in the present intervention incorporated both verbal and non-verbal autonomy-supportive and controlling tutor behaviors. The analysis of data for each behavior separately also indicated which particular behaviors may be more open to change, rather than grouping behaviors in terms of their underlying nature.

4.1. Limitations of the intervention and future research recommendations

The present intervention was limited by the small sample of tutors employed. Although results appear promising in terms of the success of the intervention in significantly changing two behaviors, the intervention should be implemented on a larger scale, in order to gather stronger evidence for its efficacy. Further, the brief nature of the intervention may also have contributed to its failure to change many of the behaviors. Studies that have reported greater behavior change have tended to use longer training sessions in autonomy-supportive methods (e.g., Chatzisarantis & Hagger, 2009). Increasing the duration of training and staggering the intervention in further applications, with a focus on just a few behaviors in any one training session, may increase its future success in behavioral modification. The limited timeframe in which tutors had the opportunity to actualize the behavioral modifications within the study may also have contributed to lack of significant change in many of the taxonomies. Future studies would

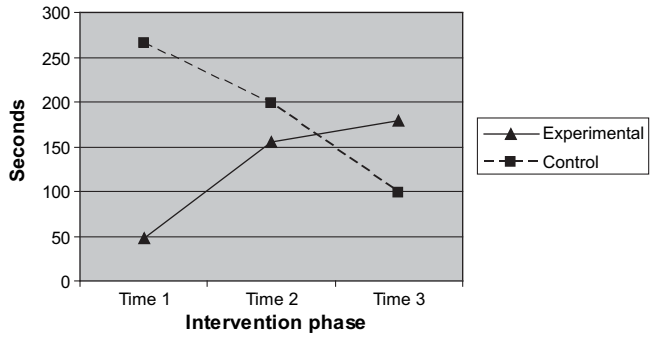

Fig. 1. The interaction between phase of the intervention and experimental condition for time students spent talking in class.

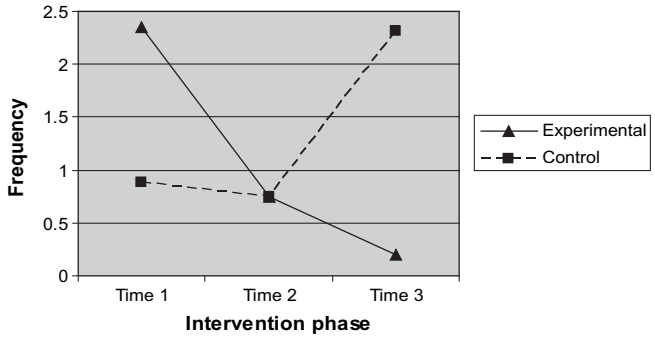

Fig. 2. The interaction between phase of the intervention and experimental condition for the frequency of directives and commands issued by tutors.

benefit from extending the tutors' training in autonomy-supportive teaching and employing a longer follow-up period in which tutors are able to increasingly implement the autonomy-supportive style. Refresher training sessions to consolidate the tutors' learning of these techniques could aid their behavior change in this respect. Further, although the importance of all the behaviors was emphasised in terms of fostering an autonomy-supportive climate, it is possible that stressing the significance of the primary behaviors could have resulted in tutors devoting less attention to the secondary behaviors. Future applications of the intervention may benefit from eliminating this distinction and determining whether this facilitates greater change in the subset of behaviors currently categorised as secondary. An additional consideration is that the intervention may be assimilated more easily in tutors with greater teaching experience. As the sample employed in the present study were not highly experienced, greater difficulty may have been experienced in trying to cope with the relatively unfamiliar experience of leading seminars, in addition to implementing the behavioral change required by the intervention.

A further limitation of the intervention was the omission of direct manipulations to support students' needs for relatedness and competence. Although several of the behavioral manipulations may serve to support these needs, for example acknowledging the students' perspective and offering hints when a student encountered difficulty, provision of structure and demonstration of interpersonal involvement would have addressed these needs more directly (e.g., Edmunds et al., 2008). Empirical evidence in the exercise domain has demonstrated that teachers are able to modify these socio-contextual factors, in addition to the autonomy-supportive climate, to incur positive effects on motivational, behavioral and affective outcomes (Edmunds et al., 2008). Further research could therefore usefully explore whether university and other tutors are able to adapt their teaching style to support all three fundamental needs. SDT proposes that satisfaction of the needs for autonomy and competence is fundamental to the development of intrinsic motivation (Ryan & Deci, 2000), suggesting that synergistic effects on students' intrinsic motivation may occur with interventions that also support the need for competence. Future research should also explicitly account for tutors' autonomous motivation for teaching, as this may exert a substantial influence over teachers' autonomy-supportive behaviors (Roth et al., 2007).

5. Conclusions

The present study demonstrates that a brief intervention targeting autonomy-supportive behaviors in a university context results in significant increases in autonomy-supportive behaviors among postgraduate tutors and provides a detailed protocol for future replications of the intervention, highlighting the importance of rigorous assessment methods to ensure intervention fidelity. Future research should address the methodological limitations of the present intervention and assess its efficacy in other domains.

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