British Journal of Educational Psychology (2010), 80, 307–323

The British Psychological Society
www.bpsjournals.co.uk

Interpretation of self-talk and post-lecture affective states of higher education students: A self-determination theory perspective

Emily J. Oliver[1,2]*, David Markland[1] and James Hardy[1]
[1]Bangor University, Gwynedd, UK
[2]Aberystwyth University, UK

Background. Self-determination theory posits that informational versus controlling interpretations of intra-personal events have positive and negative implications, respectively, for well-being. Self-talk represents an intra-personal event that could be interpreted as informational or controlling and may attenuate or exacerbate the negative effects of a stressful experience.

Aims. The present study investigated relationships between students' informational and controlling interpretations of self-talk, and their post-lecture affective state. An interactive hypothesis, whereby self-talk would be more strongly associated with well-being when students reported experiencing the lecture as stressful, was also tested.

Sample. Participants were 146 male and female undergraduate students (M age = 19.25, SD = 2.57) enrolled on research methods/statistics modules.

Methods. Immediately post-lecture, participants completed a measure of informational and controlling self-talk, short forms of the State-Trait Anxiety Inventory and the Positive and Negative Affect Scale, and self-report measures of their experience and understanding of the lecture.

Results. Findings from moderated hierarchical regression analyses indicated that informational self-talk was positively associated with positive affect regardless of students' experience or understanding of a lecture. Significant interactions were found between controlling self-talk and experience and understanding, in that a negative experience or poor understanding predicted higher state anxiety and negative affect when students used high, but not low, levels of controlling self-talk.

Conclusions. The functional significance of students' self-talk may have implications for affect in higher education, suggesting that providers should promote the use of self-talk that emphasizses students' autonomy and competence.

* *Correspondence should be addressed to Emily J. Oliver, Department of Sport and Exercise Science, Aberystwyth University, Carwyn James Building, Penglais Campus, Aberystwyth, Ceredigion SY23 3FD, UK (e-mail: ejo@aber.ac.uk).*

DOI:10.1348/000709909X477215

Identifying factors that influence students' affect and well-being is an ongoing concern within the educational literature. Research monitoring the emotional well-being of university students has shown that they experience heightened levels of anxiety on entry to higher education (Cooke, Bewick, Barkham, Bradley, & Audin, 2006), and previous work has focused on potential ways to improve well-being. For example, researchers have examined the role of financial and pastoral institutional support (e.g., Nettles & Perna, 1997), as well as teaching styles and course structures (e.g., Taylor, 2005). However, there is limited research examining the ways in which students themselves cope with specific stressors (e.g., intellectually challenging topics). In the present study, it is suggested that promoting the appropriate use of self-talk may represent a useful way of enhancing students' abilities to cope with the challenges of higher education.

Research methods and statistics courses have consistently been identified as a significant source of stress for undergraduate students (e.g., Zeidner, 1991). In the sciences, statistics modules typically form a core element of undergraduate teaching, which students must pass in order to progress, and are often unpopular and perceived as difficult due to their complex, technical nature (Ball & Pelco, 2006). Consequently, the identification of strategies that might enhance students' coping and reduce the anxiety associated with such stressors would be likely to have important applied implications concerning both progression and affect oriented well-being.

One such psychological strategy that may be related to coping and mood states is self-talk. Historically, a number of terms have been used to refer to self-talk including inner speech, internal dialogue, private speech, verbal rehearsal, and egocentric speech (DePape, Hakim-Larson, Voelker, Page, & Jackson, 2006). In the present study, self-talk was broadly conceptualized along similar lines to this existing research as a multidimensional phenomenon concerned with verbalizations addressed to oneself, expressed either overtly or covertly (cf. Hardy, 2006).

Previous educational research has shown that learners actively use self-talk to guide, plan, and monitor their own activity (Diaz & Berk, 1992), with increases in self-talk linked to enhanced self-regulation (Nelson & Van Meter, 2006). The potential beneficial effects of self-talk are highlighted by research findings revealing that students' use of positive self-talk in the classroom is associated with elevated self-esteem (Burnett & McCrindle, 1999) and that motivational strategies including mastery and performance self-talk positively predict learning, effort, and classroom performance (Wolters, 1999). Additionally, studies in sport and physical education have shown that self-talk is related to a number of important outcome variables. For example, positive and instructional self-talk have been shown to improve learning (Cutton & Landin, 2007), enhance persistence and effort (Peters & Williams, 2006), and to improve performance and attainment levels (Hamilton, Scott, & MacDougall, 2007).

Given the pervasiveness of theoretical links between cognition and affect (e.g., Beck, 1976; Lazarus, 1991; Meichenbaum & Butler, 1979), and that cognitive theories of anxiety assert that self-talk lies at the core of anxiety (Conroy & Metzler, 2004), it is perhaps surprising that only limited research has explicitly focused upon the relationship between self-talk and affect. However, there are some findings to suggest that self-talk is directly associated with affective states. Calvete *et al.* (2005) reported moderate negative correlations between positive self-talk, including minimizing problems and presenting a positive orientation, and anger, depression, and anxiety among undergraduate students. Kendall and Treadwell (2007) found that children's use of anxious self-talk (e.g., 'I wish I could do things right'; 'Why do these things happen

to me?') consistently predicted anxiety, and that changes in the use of anxious self-talk mediated the beneficial effects of cognitive behaviour therapy.

Studies from the sports domain provide further evidence that self-talk may be related to affect in stressful environments. Hardy, Gammage, and Hall (2001) found that athletes use self-talk to control pre-competition anxiety as well as to cope in challenging and difficult situations. Conroy and Metzler (2004) reported that distinct patterns of athletes' negative self-talk (i.e., self-controlling, self-neglecting, self-attacking, and self-blaming self-talk) were positively associated with sport anxiety. Intervention studies in sport also support a link between self-talk and anxiety. Hatzigeorgiadis, Zourbanos, and Theodorakis (2007) reported that both cognitive (worry) and somatic (interpretation of physical symptoms) forms of anxiety were lower when participants used anxiety-control self-talk (e.g., 'calmly') compared to instructional self-talk (e.g., 'ball-target'). Taken together, these findings offer some support for the proposition that it may be possible to use self-talk to help cope with stressors.

Although research has established links between different types of self-talk and affect, as well as other outcomes, this literature can be criticized for lacking a coherent theoretical basis (cf. Hardy, 2006). In addition, research has tended to focus on the content of self-talk, rather than its interpretation or the function it may serve for the individual. Self-determination theory (SDT; Deci & Ryan, 1985, 2000) provides a framework which could further our understanding of how self-talk might be linked to emotional states. SDT is a theory of motivation which posits that humans possess innate psychological needs to experience autonomy, competence, and relatedness and that the satisfaction of these needs is essential for personal growth and emotional well-being (Deci & Ryan, 2000). The need for autonomy refers to a need to act with volition, rather than feeling controlled or compelled to act. The need for competence concerns the need to deal effectively with one's environment and to effect outcomes. The need for relatedness involves a need to experience close and satisfying relationships with others. According to SDT, greatest well-being is experienced when these needs are satisfied, whereas thwarting of needs is likely to result in ill-health, negative psychological states, and poor well-being (Ryan & Deci, 2000).

Cognitive evaluation theory (CET; Deci & Ryan, 1985), a subtheory within SDT, posits that events relevant to the initiation and regulation of behaviour can have one of three aspects that impact upon psychological need satisfaction and subsequent well-being. Informational events facilitate need satisfaction by providing effectance-relevant feedback and the experience of choice. Controlling events undermine need satisfaction by engendering pressures to act in particular ways. Finally, amotivational events facilitate perceptions of incompetence and promote amotivation. Importantly, in terms of their functional significance, CET makes no distinction between externally administered events, such as the provision of feedback or rewards by others, and intra-personal events such as self-monitoring, self-reinforcement, and self-control (Deci & Ryan, 1985). Thus, CET proposes a distinction between internally informational regulating events which occur within the person and are experienced as free from pressures, and internally controlling regulation in which the individual pressurizes themselves to act (Ryan, 1982). Deci and Ryan (1985) argue that to regulate oneself informationally is quite different from regulating oneself controllingly, and that controlling self-regulation is likely to have negative consequences for motivation and well-being. Drawing on this theoretical framework, we propose that self-talk represents an internal regulatory event that can be experienced as informational or controlling, with subsequent differential consequences for affective states. Importantly, the

emphasis in CET is on the functional significance of events, that is, how one experiences or interprets events, rather than their content *per se*. In the context of self-talk, we propose that how one interprets self-talk (i.e., whether the functional significance is informational or controlling) is independent of content. For example, the phrase 'concentrate' may be experienced as controlling (as in self-imposed pressure) or as informational (as in self-encouraging).

Thus, the overall aim of this study was to examine associations between the interpretation of self-talk and post-lecture affect. To this end, the primary purpose of the study was to examine whether informational and controlling self-talk were associated with post-lecture anxiety and affect. To accomplish this primary purpose, a secondary thrust of the present research was to determine whether informational and controlling self-talk could be empirically differentiated by developing a measure of the two interpretations of self-talk. Drawing on Deci and Ryan's (1985) description of informational and controlling events, it was proposed that informational self-talk would emphasize the individuals' own perspective, highlight opportunities for self-initiation and choice, present a meaningful rationale if choice is constrained, avoid the use of pressures and contingencies to motivate behaviour, and provide positive feedback (Vansteenkiste, Lens, & Deci, 2006). Conversely, controlling self-talk would be characterized by pressures to act, think, or feel a certain way and reflect a perceived lack of choice and control. It was hypothesized that informational self-talk would be positively related to positive affect and negatively associated with negative affect and state anxiety. On the other hand, controlling self-talk would be positively associated with negative affect and state anxiety but negatively correlated with positive affect.

In addition to hypothesizing direct associations between self-talk and affect, it was proposed that controlling and informational forms of self-talk might exacerbate and attenuate, respectively, the association between an unpleasant or stressful experience and students' affect and anxiety. This is due to the increased likelihood that individuals will require and respond positively to additional resources or assistance under conditions of greater strain. This is aligned with research within a higher education setting that has shown that intra-personal factors such as the use of adaptive coping styles buffer the effects of high levels of stress on anxious and depressive symptoms (Crockett *et al.*, 2007). It was anticipated that informational self-talk would function as a form of adaptive coping, and as such would have greater positive effects when stress was high than when stress was low. Conversely, the absence of informational self-talk would have a greater detrimental effect when stress was high than when stress was low. Consequently, it was expected that informational self-talk would have a greater influence upon affect when individuals experienced the situation as more demanding; in this case, when students reported a poor understanding of material covered during a lecture, or a negative experience of the lecture. Furthermore, it was predicted that the negative influence of controlling self-talk would be more evident when students reported either a negative experience or a poor level of understanding.

Method

Participants

Participants were 146 undergraduate students (83 males, 49 females, 14 unreported) with a mean age of 19.25 years ($SD = 2.57$). All students were based within a Sport Science department, and were enrolled on first or second year research

methods/statistics modules. A total of 249 students were enrolled on these two modules, which were delivered by two separate teaching teams. These modules were targeted as they form a compulsory element of these undergraduates' courses, which students must pass in order to progress. To ensure voluntary participation, no course credit was given for taking part, and the researcher collecting data was not involved in the teaching or assessment of the modules.

Measures

Self-talk

A set of 17 items were generated to assess controlling and informational self-talk. The items were developed and refined through discussion with peers, all of whom have previously published work on SDT, including one expert in SDT and measurement issues, and one expert in self-talk. In addition, item content was based on those used in previous literature examining autonomy-supportive or controlling communications, with modifications to make them applicable to self-verbalizations (e.g., Deci, Driver, Hotchkiss, Robbins, & Wilson, 1993; Vansteenkiste *et al.*, 2005). According to CET, it is the relative salience of the aspects of events to an individual that determines their functional significance. Thus, the same event could have a different functional significance for different people. Therefore, drawing on traditional methodologies of personality paradigms which seek to understand individuals in their own terms (King & Napa, 1998), we developed a self-talk measure that enabled students to report a potentially limitless range of self-talk, rather than imposing experimenter-generated statements, and then to rate their self-talk as either informational or controlling. Similar to research examining self-generated goals (e.g., Little, 1989; Sheldon & Kasser, 1998), in which participants record their personalized examples or stems and then rate these on variables of interest, students were asked to report the three most frequent self-talk statements they said (aloud or silently) to themselves during the lecture. They then completed the set of 17 items in response to each self-talk statement. For example, a student might report that they said the word 'concentrate'. Items required the student to rate the extent to which self-talk 'made me feel I had no control over the situation' or 'reassured me that I was in control'. These example items reflect controlling and informational self-talk, respectively. Items were scored on a five-point Likert-type scale from 1 (not at all) to 5 (very much so). Informational and controlling self-talk values were calculated by summing means of the item scores for the three statements and dividing by three.

Positive and negative affect

The 10-item International Positive and Negative Affect Scale Short Form (I-PANAS-SF; Thompson, 2007) was employed to measure positive and negative affect. This questionnaire consists of two subscales, positive affect and negative affect, which in line with Watson, Clark, and Tellegen's (1988) conceptualization is considered to be independent dimensions of affect. Participants were asked to rate how they felt 'right now' on five-point Likert-type scales from 1 (not at all) to 5 (very much so). Items included 'alert' (positive affect; $N = 5$ items) and 'hostile' (negative affect; $N = 5$ items). Subscale scores were created by summing relevant item ratings. The I-PANAS-SF has been found to be a reliable, valid and efficient tool for measuring affect

(Thompson, 2007). In the present investigation, Cronbach's alphas were .87 for positive affect and .89 for negative affect.

State anxiety

State anxiety was measured using Marteau and Bekker's (1992) six item short-form version of the state scale of Spielberger's (1983) State-Trait Anxiety Inventory (STAI-Y6). Marteau and Bekker reported acceptable reliability among individuals manifesting a range of anxiety levels. Participants were asked to indicate how they felt 'right now, at this moment' on items including 'I feel calm' and 'I feel worried'. Items were rated on a four-point Likert-type scale from 1 (not at all) to 4 (very much), with a state anxiety score formed by summing the item ratings. Cronbach's alpha was .76 in the present sample.

Lecture experience and understanding

Two single item measures assessed students' confidence in their understanding of the lecture material and their overall experience (positive or negative) of the lecture. Understanding was scored on a seven-point scale ranging from 1 (not at all confident) to 7 (very confident). Overall experience of the lecture was rated on a seven-point scale from -3 (very negative) to $+3$ (very positive), with 0 representing neutral.

Procedure and data analysis

Prior to informed consent being obtained, participants were informed that the purpose of the study was to examine links between self-talk and affect. Students completed the battery of questionnaires immediately after one research methods lecture; this took approximately 15 min. Due to the novel structure of the self-talk questionnaire, prior to hypothesis testing a principal components analysis was conducted in order to refine the measure and ascertain its structural integrity.

Moderated hierarchical regression analysis was used to test whether the two types of self-talk had differential main effects on affect and anxiety and whether they moderated the influences of experience and understanding of the lecture on the state affect variables. This was conducted in the manner recommended by Jaccard, Turrisi, and Wan (1990), and has been widely used in previous research (e.g., Standage, Treasure, Hooper, & Kuczka, 2007). The independent variables were standardized prior to computing the product terms, and the unstandardized regression coefficients were examined to interpret the form of the interaction. All hypotheses were tested against a significance level of $p < .05$.

Results

Self-talk questionnaire

Participants reported statements relating to a range of topics, including the lecture content (e.g., 'what do I need to know?'; 'I've covered this before'), general encouragement (e.g., 'come on don't get left behind again'), instructions (e.g., 'make notes'), current feelings (e.g., 'I'm hungry'), and irrelevant statements (e.g., 'I'll go to the gym tonight'). The broad range of self-talk reported provides additional justification for using a personalized approach rather than generic item stems. From examining the content of statements and ratings both within and between participants, it was noted

that there was a tendency for some types of statement to be rated by most participants as either informational or controlling. However, this was not universal. This is consistent with Deci and Ryan's (1985) original theorizing that certain events can have an average functional significance across groups of people but can be experienced differently by different people. For example, a particular type of event might typically be experienced as either informational, controlling, or amotivational by most people most of the time. However, an event, in this case a self-talk statement, can only be properly labelled with respect to how it is experienced by an individual at a given time.

In order to determine whether the proposed informational and controlling self-talk items could be empirically differentiated, principal components analyses (PCA) were conducted. Three separate PCAs were conducted, with each completion of the item set treated as a separate sample. Within each of the three analyses, we aimed to identify the best indicators of informational and controlling self-talk through the elimination of cross loading and/or low loading items. This allowed us to also identify the most consistent indicators of informational and controlling self-talk across the three statements provided, which were subsequently employed in our main analyses. Although we are not aware of any research directly advocating this strategy, previous researchers have conducted multiple factor analyses on the same item set when completed by different assessors for similar reasons to those in the present investigation (e.g., Achenbach, Dumenci, & Rescorla, 2003).

For statement 1, a principal components analysis with promax rotation, using a forced two factor solution highlighted two factors with eigenvalues greater than 1.0 which accounted for 44.5% of the variance. The correlation between the two factors was .048. For statement 2, the two factors explained 46.8% of the variance, and an inter-factor correlation of .001 was found. For statement 3, 46.8% of the variance were accounted for, and the correlation between the two factors was .136. Table 1 shows the items and factor loadings for each analysis. Examination of item content revealed that across all three analyses, the first factor contained items intended to tap informational types of self-talk, whereas the second factor contained those items intended to tap controlling self-talk. Thus, the factors were labelled accordingly. The correlations between the two factors in all three cases were not significantly greater than zero. Given this, and the conceptual and empirical distinction between items, it was decided that the two factors represented independent constructs in the manner expected. The conditions for item retention were that an item loaded on its intended factor at or above a threshold of .3 in at least two analyses, and approached this threshold in the third analysis, and that it did not load on its unintended factor above .3 in more than one analysis. This threshold has been advocated by previous researchers (e.g., Tabachnick & Fidell, 2001). Items 1, 3, 5, 7, 13, 15, and 17 were retained for the informational self-talk factors. Items retained for the controlling self-talk factor were 2, 4, 8, and 14. Items that did not load clearly on their intended factors tended to be those that were either more complex, structurally or semantically (e.g., 'allowed me to better understand what I need to do'; 'directed me to think or feel a certain way'), or vague (e.g., 'was commanding'). Informational and controlling self-talk values for subsequent analyses were calculated by summing the three statement scores and dividing by three.

Descriptive statistics

Table 2 shows the means, standard deviations, and bivariate correlations between the variables of interest. Students reported low to moderate levels of state anxiety

Table 1. Principal components analysis of self-talk items: promax rotated factor loadings

	Statement 1		Statement 2		Statement 3	
	Factor 1	Factor 2	Factor 1	Factor 2	Factor 1	Factor 2
1. Made me feel I was in control	.843	−.025	.800	−.171	.837	−.142
3. Was self-encouraging	.812	−.132	.769	−.125	.774	−.086
5. Made me feel more in charge	.774	−.101	.809	−.027	.813	.025
7. Assisted my understanding	.290	.009	.720	.127	.710	.176
9. Allowed me to better understand what I needed to do	.572	.086	.687	.237	.425	.357
11. Acknowledged how I was feeling	.118	.604	.222	.051	.144	.341
13. Provided me with positive feedback	.753	−.019	.725	−.075	.816	−.127
15. Helped reduce the pressure I put on myself	.676	.169	.666	−.194	.717	.001
17. Reassured me that I was in control	.833	−.080	.815	−.053	.845	−.028
2. Made me feel pressured	.035	.675	−.200	.687	−.173	.586
4. Made me feel I had no choices	−.147	.693	−.148	.722	−.127	.635
6. Directed me to think or feel a certain way	.188	.604	.301	.345	.310	.432
8. Was self-critical	.143	.490	.047	.487	−.104	.677
10. Was commanding	.444	.338	.384	.611	.041	.722
12. Told me what I should be doing	.343	.250	.528	.471	.028	.491
14. Made me feel I had no control over the situation	−.283	.673	−.406	.544	−.271	.474
16. Was directive	.659	.130	.405	.275	.241	.642

($M = 11.11$, potential scoring range 4–24), low levels of negative affect ($M = 8.09$, potential scoring range 5–25), and moderate levels of positive affect ($M = 14.9$, potential scoring range = 5 - 25). In addition, students reported feeling moderately confident regarding their understanding of the lecture ($M = 4.56$, potential scoring range 1–7), and rated their experience of the session as somewhat positive ($M = 1.01$, potential scoring range = −3 to + 3). Experience and understanding of the lecture were both significantly positively correlated with positive affect, and significantly negatively associated with state anxiety and negative affect. Informational self-talk

Table 2. Means, standard deviations, and intercorrelations among the variables

Mean	*SD*	1	2	3	4	5	6	7
1. Experience of lecture	1.01	1.21						
2. Understanding of lecture	4.56	1.34	.317**					
3. Informational self-talk	2.83	0.71	.349**	.132				
4. Controlling self-talk	2.49	0.63	−.088	−.140	.132			
5. Positive affect	14.90	3.99	.380**	.194*	.373**	.129		
6. Negative affect	8.09	3.67	−.179*	−.289**	−.086	.379**	.116	
7. State anxiety	11.11	3.37	−.246**	−.340**	−.092	.282**	−.121	.729**

Note. *$p < .05$; **$p < .01$; scoring ranges: experience − 3 to 3; understanding 1–7; self-talk variables 1–5; positive and negative affect 5–25; state anxiety 4–24.

showed a significant moderate positive correlation with positive affect. Controlling self-talk was significantly positively correlated with negative affect and state anxiety.

Hypothesis testing

Four moderated hierarchical regressions were conducted for each dependent variable. Lecture experience or understanding were entered in the first block, then controlling or informational self-talk in block two, then a cross-product of the two previous predictors in block three. The results are shown in Table 3. Prior analysis of casewise diagnostics and Mahalanobis distances revealed no univariate or multivariate outliers.

Table 3. Summary of regression statistics concerning the relationships investigated

Dependent variable	Independent variable	R^2	ΔR^2	$F_{(df)}$	β	$p(b)$
Positive affect	Lecture experience	.153	.153*	$12.04_{(3,120)}$	0.309	.000
	Informational self-talk	.218	.064*		0.171	.002
	Product	.231	.014		0.118	.147
Positive affect	Lecture understanding	.036	.036	$8.22_{(3,120)}$	0.169	.055
	Informational self-talk	.160	.124*		0.348	.000
	Product	.170	.010		0.106	.222
Positive affect	Lecture experience	.154	.154*	$10.51_{(3,123)}$	0.405	.000
	Controlling self-talk	.183	.028*		0.163	.046
	Product	.204	.021†		−0.146	.072
Positive affect	Lecture understanding	.039	.039*	$2.88_{(3,123)}$	0.222	.013
	Controlling self-talk	.065	.026†		0.161	.070
	Product	.066	.000		−0.021	.815
Negative affect	Lecture experience	.038	.038*	$2.00_{(3,121)}$	−0.197	.040
	Informational self-talk	.038	.000		−0.022	.819
	Product	.047	.009		−0.097	.281
Negative affect	Lecture understanding	.055	.055*	$2.54_{(3,121)}$	−0.236	.012
	Informational self-talk	.058	.003		−0.054	.549
	Product	.059	.001		−0.031	.735
Negative affect	Lecture experience	.029	.029†	$10.07_{(3,124)}$	−0.140	.086
	Controlling self-talk	.164	.135*		0.362	.000
	Product	.196	.032*		−0.179	.028
Negative affect	Lecture understanding	.065	.065*	$10.70_{(3,124)}$	−0.193	.019
	Controlling self-talk	.187	.123*		0.342	.000
	Product	.206	.018†		−0.136	.095
State anxiety	Lecture experience	.068	.068*	$3.36_{(3,121)}$	−0.270	.005
	Informational self-talk	.068	.000		−0.001	.987
	Product	.077	.009		−0.096	.277
State anxiety	Lecture understanding	.099	.099*	$4.80_{(3,121)}$	−0.329	.000
	Informational self-talk	.102	.002		−0.045	.606
	Product	.106	.005		−0.072	.421
State anxiety	Lecture experience	.063	.063*	$8.19_{(3,124)}$	−0.231	.006
	Controlling self-talk	.130	.068*		0.254	.003
	Product	.165	.035*		−0.187	.025
State anxiety	Lecture understanding	.104	.104*	$10.06_{(3,124)}$	−0.272	.001
	Controlling self-talk	.162	.058*		0.226	.006
	Product	.196	.034*		−0.185	.025

Note. *Indicates value significant at $p < .05$; †indicates value approaching significance; degrees of freedom differ due to missing data and/or the omission of outliers specific to the analysed variables.

Positive affect

Both lecture experience and understanding significantly predicted positive affect in all four regression analyses. Informational self-talk explained 6.4 and 12.4% of variance in positive affect over and above the effects of lecture experience and understanding, respectively. Controlling self-talk explained 2.8 and 2.6% of variance in positive affect over and above the effects of lecture experience and understanding, respectively, although examination of the beta coefficients revealed that these were in the opposite direction to that hypothesized. None of the interaction terms were significant.

Negative affect

Lecture experience and understanding were significantly negatively related to negative affect in all four regressions. Although informational self-talk did not explain any additional variance, controlling self-talk explained 13.5 and 12.3% of the variance in negative affect over and above the effects of lecture experience and understanding, respectively. In addition, there was a significant interaction between lecture experience and controlling self-talk ($p < .05$). Figure 1 shows the form of this interaction plotted using the regression estimation equation formed from the unstandardized coefficients, in the manner recommended by Jaccard *et al.* (1990). Plot points were calculated for hypothetical participants scoring one standard deviation above the mean, at the mean, and one standard deviation below the mean (labelled high, mean, and low, respectively) on each of the predictor variables, as recommended by Cohen and Cohen (1983). Figure 1 indicates that increases in negative affect associated with a negative experience of the lecture only occur when mean or high levels of controlling self-talk are present, whereas when students reported a positive experience, use of controlling self-talk was minimally associated with negative affect.

Following the procedure described by Aiken and West (1991), for each interaction simple slopes of the regression lines were computed to identify whether the slopes differed significantly from zero. For the regression of negative affect on lecture experience, there was a significant negative regression at high levels of controlling

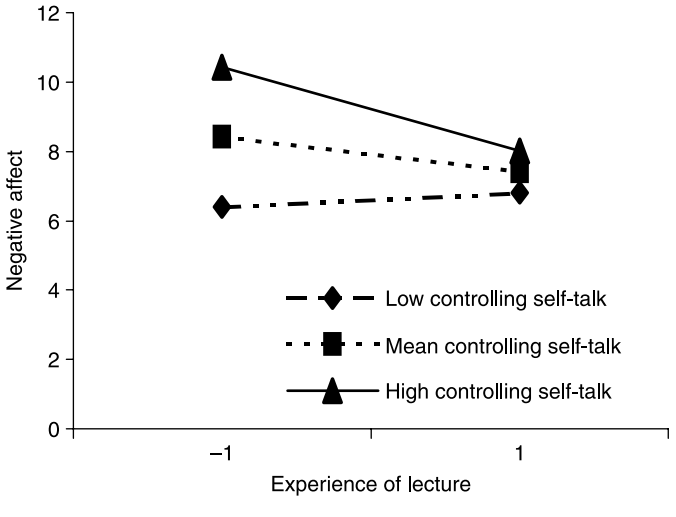

Figure 1. Interaction of lecture experience and controlling self-talk predicting negative affect.

self-talk, $t_{(124)} = -2.782$, $p < .01$. The regression at low levels of controlling self-talk did not differ from zero, $t_{(124)} = 0.473$, $p = .637$. The regression at the mean level of controlling self-talk was negative but non-significant, $t_{(124)} = -1.692$, $p = .093$.

State anxiety

Lecture experience and understanding were significantly negatively related to state anxiety in all four regressions. However, informational self-talk did not explain any additional variance. Conversely, controlling self-talk explained 6.8 and 5.8% of the variance in state anxiety over and above the effects of lecture experience and understanding, respectively. In addition, two interaction terms explained significant additional variance in state anxiety: lecture experience and controlling self-talk ($p < .05$), and lecture understanding and controlling self-talk ($p < .05$). These two interactions were plotted in Figures 2 and 3. Figure 2 indicates that increases in state anxiety associated with a negative experience of the lecture only occurred when mean or high levels of controlling self-talk were present, whereas when students reported a positive lecture experience, use of controlling self-talk had no effect. Simple slopes analyses showed that for the regression of state anxiety on lecture experience, the negative regression lines at mean and high levels of controlling self-talk were significant ($t_{(124)} = -2.758$, $p < .01$; $t_{(124)} = -3.547$, $p < .01$; respectively).

The regression of state anxiety on lecture experience at low levels of controlling self-talk did not differ from zero, $t_{(124)} = 0.473$, $p = .637$. Figure 3 indicates that increases in state anxiety associated with a less confident understanding of lecture material only occurred when mean or high levels of controlling self-talk were present, whereas when students reported a positive experience, use of controlling self-talk had no effect. For the regression of state anxiety on lecture understanding, simple slopes analysis confirmed significant negative regression lines at mean and high levels of controlling self-talk ($t_{(124)} = -2.758$, $p < .01$; $t_{(124)} = -3.547$, $p < .01$, respectively). The regression of state anxiety on lecture understanding at low levels of controlling self-talk did not differ from zero, $t_{(124)} = -0.214$, $p = .831$.

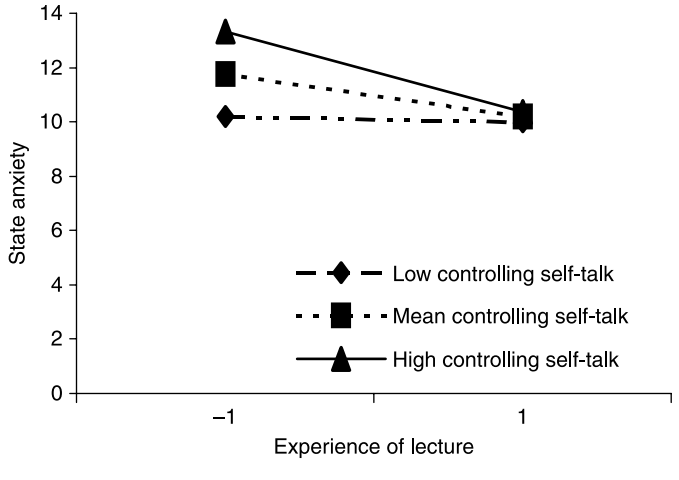

Figure 2. Interaction of lecture experience and controlling self-talk predicting state anxiety.

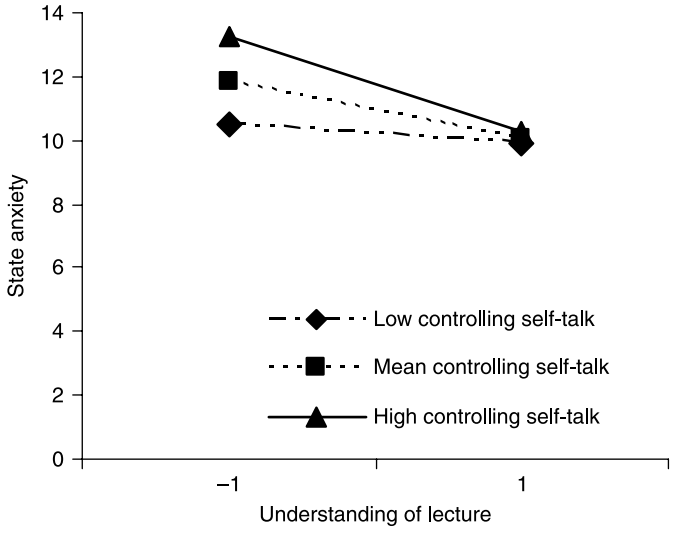

Figure 3. Interaction of lecture understanding and controlling self-talk predicting state anxiety.

Discussion

The primary purpose of this study was to investigate whether the students' interpretation of self-talk used during a lecture was associated with their post-lecture affect. Results indicated a positive association between informational self-talk and positive affect that was consistent with our proposed hypothesis. In addition, hierarchical regressions indicated that informational self-talk explained variance in positive affect over and above that accounted for by both lecture experience and understanding, highlighting the independent contribution of self-talk to affective state even when the influences of specific events are considered. These findings are consistent with Deci and Ryan's (1985) theoretical proposition that informational intrapersonal events, including thoughts and feelings, which foster greater autonomy and enhance perceptions of competence, are related to greater emotional well-being. The results are also aligned with empirical studies highlighting the benefits of both externally and internally provided positive informational feedback (e.g., Ryan, 1982).

The findings pertinent to controlling self-talk, negative affect and state anxiety were also consistent with our *a priori* hypotheses. Controlling self-talk was moderately and positively correlated with negative affect and state anxiety; explaining additional variance in both variables over and above lecture experience and understanding. Negative feedback has previously been shown to increase negative affect to a greater extent than it decreases positive affect (Ilies, De Pater, & Judge, 2007), perhaps explaining the lack of a significant correlation between controlling self-talk and positive affect in the present study.

It is worth noting that findings of non-significant associations between informational self-talk and negative affect and state anxiety might imply that although the presence of informational self-talk is associated with beneficial outcomes (e.g., elevated positive affect), its absence is not necessarily associated with poorer affective states. This provides some support for the notion that informational and controlling aspects of an event constitute two distinct factors, and that the absence of an informational interpretation does not necessarily mean that an event is interpreted as controlling.

Therefore, although informational events can have positive affective consequences, a lack of informational support does not necessarily have negative consequences. Additionally, controlling self-talk predicted significant additional variance in positive affect over and above that explained by lecture experience and understanding and this association was positive. It is unclear why controlling self-talk should have a positive association with positive affect, particularly given that, as expected, it was significantly related to higher anxiety and negative affect. However, a consideration of Russell's (1980) circumplex model of affect could explain this finding. The I-PANAS-SF positive affect items (alert, inspired, attentive, active, and determined) seem to reflect the activation (low to high arousal) dimension of the circumplex model of affect as opposed to the valence (positive to negative) dimension. It is plausible that affective arousal could be positively linked to controlling self-talk, with arousal elevated by self-talk which makes participants feel they should or have to do something. However, caution should be expressed when considering this explanation, particularly given the non-significant zero-order correlation between controlling self-talk and positive affect. Further investigation of links between types of self-talk and affect which differentiates arousal and valence dimensions is warranted.

With regard to proposed interactive effects, in opposition to our hypotheses there were no interactions involving informational self-talk. Informational self-talk was correlated with more positive mood states regardless of individuals' experiences or level of understanding. This implies that informational self-talk may be beneficial regardless of situational experience. It is possible therefore that informational self-talk operates in a different manner to typical support type variables, which would be expected to have greater benefits when challenge or stress appraisals are high (e.g., Crockett *et al.*, 2007).

For controlling self-talk, three significant interactions emerged which indicated that higher levels of negative affective states associated with a negative experience or poor understanding of a lecture only occurred when mean or high levels of controlling self-talk were present. However, it can be seen from the figures that there was little difference in negative affect or state anxiety at high levels of understanding or experience, irrespective of the level of controlling self-talk used. Although speculative, it is possible that when having a negative experience, controlling self-talk could reinforce students' low perceptions of competence and autonomy, thereby increasing negative affect and anxiety. This is somewhat aligned with literature examining goal setting which has found that controlling goals are negatively related to long-term goal commitment, attainment, and well-being (e.g., Sheldon & Elliot, 1998) as they inhibit personal choice and undermine perceptions of autonomy. Furthermore, a perceived lack of control over situations has been consistently linked to negative affect (e.g., Ferguson, Daniels, & Jones, 2006).

It is less clear why higher levels of controlling self-talk were not associated with more negative affective states when students reported high levels of understanding or a positive experience. It could be that the negative influence of controlling self-talk is rendered less influential by environmental factors that support feelings of competence. That is, if students feel capable or are having a good experience, controlling, or critical self-talk might not undermine competence, which in turn does not impact on affect. This proposition gains some support from research investigating the relative potency of self-efficacy sources, which has identified strongest effects for mastery experiences over other sources including verbal persuasion (Bandura, 1997). More specifically, in some studies, having controlled for mastery experience, the effects of other sources become non-significant (e.g., Lopez & Lent, 1992).

Given the emergence of significant interactions, it is worth noting that previous researchers have argued that field researchers tend to report considerable difficulty in finding theorized moderator effects (McClelland & Judd, 1993), and that those explaining as little as 1% of total variance should be considered important (Evans, 1985). Consequently, it should be highlighted that in the present study each significant interaction explained at least 3.2% of additional variance. Furthermore, all three interactions were of a similar form, which were consistent with the *a priori* hypotheses. These theoretically derived and empirically supported predictions lend some supportive evidence for the measure of self-talk employed in the present study. Although individuals' interpretation of their self-talk has been examined previously (e.g., Hardy, Hall, & Alexander, 2001), to the best of our knowledge, the self-talk questionnaire utilized in the current investigation is the first multiple item and theoretically driven measure of the interpretation of self-talk. This questionnaire draws upon the functional significance concept from CET which is itself a relatively under-examined, yet important, aspect of this theory. As a result, the present investigation has identified an avenue that might glean better understanding of the functional significance of events.

However, there are limitations that should be taken into consideration when interpreting the findings of the present study. The cross-sectional nature of the design means that causality can only be inferred and not assumed. For example, it might be that it is affective state that triggers the use of different types of self-talk rather than the reverse. Indeed, cognitive researchers have in the past stated that cognition and emotion are best conceptualized as interdependent, over-lapping constructs (e.g., Meichenbaum & Butler, 1979). In the present study, items were phrased to reflect sequential time points, in that participants were asked to recall self-talk used during the lecture, and then to report their post-lecture affective state 'right now, at the moment', in order to reduce the possibility of measuring self-talk caused by participants' affective states.

An additional caveat concerns the relative homogeneity of the sample. The sampling of undergraduate students has obvious implications concerning a limited age range and educational background. Consequently, researchers should exercise caution and contextual awareness when attempting to generalize the present findings to different populations. For example, it is possible that higher education students may be prone to the utilization of cognitive and problem-solving forms of coping, or may use more cognition-based self-regulation; these in turn may have consequences for their use of self-talk.

Despite these limitations, the findings of the present investigation have implications for both theory and practice. From a theoretical perspective, these results support Deci and Ryan's (1985) proposition that the informational and controlling significance of intra-personal factors, specifically in this case self-talk, are associated with one's affective state. However, according to CET the effects of controlling and informational events on affect are mediated by psychological need satisfaction. Due to our focus on the potential affective outcomes of self-talk and on its interaction with students' experience of the lectures, need satisfaction was not measured in the present investigation. Future research should explicitly examine the mediating role of need satisfaction in the relationship between self-talk and affect and in particular, moderated mediation models, to more clearly understand how the variables of interest relate to one another. In addition, given that the interpretation of self-talk seems to be related to affect, and could be argued to be potentially important in terms of long-term well-being,

further investigation into the antecedents of different types of self-talk (e.g., lecturing style) is warranted (cf. Oliver, Markland, Hardy, & Petherick, 2009).

From an applied perspective, the finding that informational self-talk was correlated with positive emotional states regardless of situational experience represents initial evidence suggestive that its use should be promoted in higher education. In addition, if encouraging students to use self-talk, it is important that these statements are self-endorsed, emphasize students' autonomy, and increase perceptions of competence. Furthermore, students should be discouraged from using self-talk that is controlling in nature, especially during a negative experience. It is proposed that training students in the use of self-talk may enable more effective coping with stressful events, potentially improving post-lecture affect and ultimately students' experience of higher education.

References

Achenbach, T. M., Dumenci, L., & Rescorla, L. A. (2003). DSM-oriented and empirically based approaches to constructing scales from the same item pools. *Journal of Clinical Child and Adolescent Psychology*, *32*, 328–340.

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage Publications.

Ball, C. T., & Pelco, L. (2006). Teaching research methods to undergraduate psychology students using an active co-operative learning approach. *International Journal of Teaching and Learning in Higher Education*, *17*(2), 147–154.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W. H. Freeman.

Beck, A. T. (1976). *Cognitive therapy and emotional disorders*. Madison, WI: IUP.

Burnett, P., & McCrindle, A. R. (1999). The relationship between significant others' positive and negative statements and self-talk, self-concepts and self-esteem. *Child Study Journal*, *29*(1), 39–48.

Calvete, E., Estevez, A., Landin, C., Martinez, Y., Cardenoso, O., Villardon, L., *et al.* (2005). Self-talk and affective problems in college students: Valence of thinking and cognitive content specificity. *Spanish Journal of Psychology*, *8*, 56–67.

Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioural sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Conroy, D. E., & Metzler, J. N. (2004). Patterns of self-talk associated with different forms of competitive anxiety. *Journal of Sport and Exercise Psychology*, *26*, 69–89.

Cooke, R., Bewick, B. M., Barkham, M., Bradley, M., & Audin, K. (2006). Measuring, monitoring and managing the psychological well-being of students. *British Journal of Guidance and Counselling*, *34*, 505–517.

Crockett, L. J., Iturbide, M. I., Torres-Stone, R. A., McGinley, M., Raffaelli, M., & Carlo, G. (2007). Acculturative stress, social support, and coping: Relations to psychological adjustment among Mexican American college students. *Cultural Diversity and Ethnic Minority Psychology*, *13*(4), 347–355.

Cutton, D. M., & Landin, D. (2007). The effects of self-talk and augmented feedback on learning the tennis forehand. *Journal of Applied Sport Psychology*, *19*, 288–303.

Deci, E. L., Driver, R. E., Hotchkiss, L., Robbins, R. J., & Wilson, I. M. (1993). The relation of mothers' controlling vocalizations to children's intrinsic motivation. *Journal of Experimental Child Psychology*, *55*, 151–162.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behaviour*. New York: Plenum Publishing.

Deci, E. L., & Ryan, R. M. (2000). The 'what' and 'why' of goal pursuits: Human needs and the self-determination of behaviour. *Psychological Inquiry*, *11*, 227–268.

DePape, A. M., Hakim-Larson, J., Voelker, S., Page, S., & Jackson, D. L. (2006). Self-talk and emotional intelligence in college students. *Canadian Journal of Behavioural Science*, *38*, 250–260.

Diaz, R., & Berk, L. (1992). *Private speech: From social interaction to self-regulation*. Hillsdale, NJ: Erlbaum.

Evans, M. G. (1985). A Monte Carlo study of the effects of correlated method variance in mode rated multiple regression analysis. *Organizational Behaviour and Human Decision Processes*, *36*, 305–323.

Ferguson, E., Daniels, K., & Jones, D. (2006). Negatively oriented personality and perceived negative job characteristics as predictors of future psychological and physical symptoms: A meta-analytic structural modelling approach. *Journal of Psychosomatic Research*, *60*(1), 45–52.

Hamilton, R. A., Scott, D., & MacDougall, M. P. (2007). Assessing the effectiveness of self-talk interventions on endurance performance. *Journal of Applied Sport Psychology*, *19*, 226–239.

Hardy, J. (2006). Speaking clearly: A critical review of the self-talk literature. *Psychology of port and Exercise*, 7, 81–97.

Hardy, J., Gammage, K. L., & Hall, C. R. (2001). A descriptive study of athlete self-talk. *Sport Psychologist*, *15*, 306–318.

Hardy, J., Hall, C. R., & Alexander, M. R. (2001). Exploring self-talk and affective states in sport. *Journal of Sport Sciences*, *19*, 469–475.

Hatzigeorgiadis, A., Zourbanos, N., & Theodorakis, Y. (2007). The moderating effects of self-talk content on self-talk functions. *Journal of Applied Sport Psychology*, *19*, 240–251.

Ilies, R., De Pater, I. E., & Judge, T. A. (2007). Emotional reactions to performance feedback: The effect on goal regulation. *Journal of Managerial Psychology*, *22*, 590–609.

Jaccard, J., Turrisi, R., & Wan, C. K. (1990). *Interaction effects in multiple regression*. Newbury Park, CA: Sage Publications.

Kendall, P. C., & Treadwell, K. R. H. (2007). The role of self-statements as a mediator in treatment for youth anxiety disorders. *Journal of Consulting and Clinical Psychology*, *75*, 380–389.

King, L. A., & Napa, C. K. (1998). What makes a life good? *Journal of Personality and Social Psychology*, *75*, 156–165.

Lazarus, R. S. (1991). Cognition and motivation in emotion. *American Psychologist*, *46*, 352–367.

Little, B. R. (1989). Personal projects analysis: Trivial pursuits, magnificent obsessions and the search for coherence. In D. M. Buss & N. Cantor (Eds.), *Personality psychology: Recent trends and emerging issues* (pp. 15–31). New York: Springer-Verlag.

Lopez, F. G., & Lent, R. W. (1992). Sources of mathematics self-efficacy in high school students. *Career Development Quarterly*, *41*(1), 3–12.

Marteau, T. M., & Bekker, H. (1992). The development of a six-item short-form of the state scale of the Spielberger State-Trait Anxiety Inventory (STAI). *British Journal of Clinical Psychology*, *31*, 301–306.

McClelland, G. H., & Judd, C. M. (1993). Statistical difficulties of detecting interactions and moderator effects. *Quantitative Methods in Psychology, Psychological Bulletin*, *114*(2), 376–390.

Meichenbaum, D., & Butler, L. (1979). Cognitive ethology: Assessing the streams of cognition and emotion. In K. R. Blankstein, P. Plinker, & J. Polivy (Eds.), *Advances in the study of communication and affect: Assessment and modification of emotional behaviour* (Vol. 6, pp. 139–163). New York: Plenum Press.

Nelson, N. W., & Van Meter, A. M. (2006). The writing lab approach for building language, literacy and communication abilities. In R. J. McCauley & M. E. Fey (Eds.), *Treatment of language disorders in children. Communication and language intervention series* (pp. 383–422). Baltimore, MD: Paul H Brooks Publishing.

Nettles, M. T., & Perna, L. W. (1997). *African American education data book: Higher and adult education* (Vol. 3). Fairfax, VA: Frederick D. Patterson Research Institute.

Oliver, E. J., Markland, D., Hardy, J., & Petherick, C. M. (2009). The effects of autonomy-supportive and controlling environments on self-talk. *Motivation and Emotion*, *32*(3), 200–212.

Peters, H. J., & Williams, J. M. (2006). Moving cultural background to the foreground: An investigation of self-talk, performance, and persistence following feedback. *Journal of Applied Sport Psychology*, *18*, 240–253.

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, *39*, 1161–1178.

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

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*, 68–78.

Sheldon, K. M., & Elliot, A. J. (1998). Not all personal goals are personal: Comparing autonomous and controlled reasons for goals as predictors of effort and attainment. *Personality and Social Psychology Bulletin*, *24*, 546–557.

Sheldon, K. M., & Kasser, T. (1998). Pursuing personal goals: Skills enable progress, but not all progress is beneficial. *Personality and Social Psychology Bulletin*, *24*, 1319–1331.

Spielberger, C. D. (1983). *Manual for the state-trait anxiety inventory STAI (Form Y)*. Palo Alto, CA: Consulting Psychologists Press.

Standage, M., Treasure, D. C., Hooper, K., & Kuczka, K. (2007). Self-handicapping in school physical education: The influence of the motivational climate. *British Journal of Educational Psychology*, *77*(1), 81–99. doi:10.1348/000709906X103636

Tabachnick, B., & Fidell, L. (2001). *Using multivariate statistics* (4th ed.). Boston, MA: Allyn and Bacon.

Taylor, R. (2005). Creating a connection: Tackling student attrition through curriculum development. *Journal of Further and Higher Education*, *29*(4), 367–374.

Thompson, E. R. (2007). Development and validation of an internationally reliable short-form of the positive and negative affect schedule (PANAS). *Journal of Cross- Cultural Psychology*, *38*(2), 227–242.

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

Vansteenkiste, M., Simons, J., Lens, W., Soenens, B., & Matos, L. (2005). Examining the impact of extrinsic versus intrinsic goal framing and internally controlling versus autonomy-supportive communication style upon early adolescents' academic achievement. *Child Development*, *76*, 483–501.

Watson, D., Clarke, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070.

Wolters, C. A. (1999). The relation between high school students' motivational regulation and their use of learning strategies, effort and classroom performance. *Learning and Individual Differences*, *11*, 281–299.

Zeidner, M. (1991). Statistics and mathematics anxiety in social science students: Some interesting parallels. *British Journal of Educational Psychology*, *61*, 319–328.

Received 14 August 2008; revised version received 4 June 2009