

Empirical study

## Motivation and coping with the stress of assessment: Gender differences in outcomes for university students



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### ABSTRACT

The main objectives of the present research were to test a conceptual model linking motivational processes involved in coping with the stress of university assessment, and to examine gender differences in these processes. Self-determined motivation was hypothesized to predict coping strategies and the response to assessment-related stress, and coping was hypothesized to play a considerable role in short- and long-term outcomes of assessment. We examined this model using multiple group path analysis. In Study 1 ( $N = 265$ ), music students' use of engagement-coping strategies led to stronger musical career intentions, while disengagement-coping strategies led to weaker intentions. In Study 2 ( $N = 340$ ), students' increased use of engagement coping, and decreased use of disengagement coping strategies led to higher grades, higher positive affect and lower negative affect. In both studies, engagement and disengagement-coping were predicted by autonomous and controlled motivation, respectively. Motivation also indirectly predicted academic outcomes through stress appraisal and coping. While women experienced higher levels of stress, men were more negatively affected by the use of disengagement-oriented coping. Gender differences were also found on the links between engagement-oriented coping and outcomes. These results fill an important gap in the literature regarding gender differences in the outcomes coping in education, as well as contributing to a better understanding of the processes linking motivation, coping and academic outcomes.

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### 1. Introduction

Men and women tend to react differently to stress, women being more likely to perceive events as stressful. Yet, in many educational domains, women tend to outperform men, and to show greater intentions to persist at university, than men (Smith & Naylor, 2001; Voyer & Voyer, 2014). What, then, can explain these differences? At university, markers of performance derived from high-stakes assessment are often important determinants of short-term and long-term cognitive and affective experiences of students. When faced with stressful assessment situations, students use strategies with varying levels of effectiveness to attempt to cope with them. Some strategies lead students to study and work toward their goals effectively, deal with the stress of

assessment, and achieve positive outcomes, while others lead students to more ineffective study strategies, and maladaptive behaviors such as procrastination and avoidance. The predictors of coping have been the subject of a vast research literature. Research has demonstrated that coping effectively is important for performance and persistence, and that motivation is strongly connected to the kinds of coping strategies people use in evaluation-salient circumstances. Yet there is little conceptual understanding of how motivation, coping, and assessment outcomes are connected.

A large body of evidence has suggested that men and women differ in the way they engage and cope with stressors (Tamres, Janicki, & Helgeson, 2002), including at school. Two recent meta-analyses of more than 400 studies including students from primary school through to university have indicated that women now outperform men in all areas of education, including mathematics (Richardson, Abraham, & Bond, 2012; Voyer & Voyer, 2014). Furthermore, Smith and Naylor (2001) have found with a sample of more than 400,000 university students, that female students are

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both more likely to display long term persistence in their chosen academic area than male students, and that persistence for females was significantly less influenced by their grades. Gender differences may also exist in the degree to which males and females benefit from different coping strategies at university (Tamres et al., 2002), but this line of inquiry has not been substantially pursued. In sum, to some extent, female and male students seem to experience short-term and long-term university outcomes differently; these differences may lie in their ways of coping with university-related stress.

In the present research, we aimed to more deeply understand motivation, coping with the stress of university assessment experiences, and the impact of coping on short-term performance and affective outcomes, as well as longer-term behavioral intentions to pursue a career in one's chosen area of study. We also aimed to investigate gender differences in light of the evidence that these may be critical in understanding the relationships between these factors.

### 1.1. An integrative model of motivation and coping in academic settings

This research is grounded in the self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000a) and coping perspectives (Lazarus & Folkman, 1984). Ntoumanis, Edmunds, and Duda's (2009) integrative conceptual framework of motivation and coping is especially helpful in understanding how motivation regulations, stress and coping can explain behavioral and psychological outcomes in healthcare settings. Evidence suggests that Ntoumanis et al.'s model is generalizable to educational outcomes and may be an effective way to understand motivation and coping in relation to university assessment. As such, we propose a modified version of Ntoumanis et al.'s model, adapted to educational settings. This adapted model has three main components. First, motivation regulation (autonomous versus controlled motivation) is hypothesized to have an impact on stress appraisals in evaluative contexts. Second, motivation regulation and stress appraisals in turn lead students to use different coping strategies to face the stress of assessments. Third, the types of coping strategies used are expected to play an important role in the affective, cognitive, and academic experiences of students facing assessment and examinations. Research supporting the relationships in this model is presented in the following sections.

### 1.2. Motivation, stress, and coping

Coping refers to the actions and thoughts people use to face a situation that is perceived as threatening or stressful (Folkman, 1984; Folkman & Lazarus, 1985; Lazarus & Folkman, 1991). Coping is one of the more proximal processes that predicts psychological and behavioral responses to stress (Ntoumanis et al., 2009). Hundreds of coping strategies can be identified that can be categorized in a limited number of higher-order categories (Skinner, Edge, Altman, & Sherwood, 2003). Carver and Connor-Smith (2010), Connor-Smith, Compas, Wadsworth, Thomsen, and Saltzman (2000), and Connor-Smith and Flachsbart (2007) have further emphasized that the distinction between engagement and disengagement coping strategies might be the most important. Engagement-oriented coping responds to stressful events by using strategies such as planning and positive reinterpretation, while disengagement-oriented coping includes strategies such as disengaging, denial, and blame (Carver, Scheier, & Weintraub, 1989). Research has agreed that the effectiveness of the various coping strategies is context-specific (Folkman & Moskowitz, 2004). No individual coping strategy is effective in all situations—the

effectiveness of a specific coping strategy depends on its suitability to the stressor (Lazarus & Folkman, 1984).

Coping processes are also thought to be influenced by individuals' motivational orientations in a given situation (Lazarus & Folkman, 1991; Ntoumanis et al., 2009). SDT accounts for the different types of motivational orientations that may impact coping processes. The potential of SDT in this context lies in its strong explanatory power in terms of engagement, persistence, and success in a given activity, as well as the psychological consequences of engaging in this activity. SDT proposes that behavioral regulation ranges on a continuum from controlled (e.g., external, introjected) regulation to more autonomous (e.g., identified, integrated, intrinsic) regulation (Ryan & Deci, 2000b). At the controlled end, behavior is not undertaken for its own sake, but is considered as the means to an external or internal end (e.g. to get a reward, to avoid a punishment, or to relieve internal feelings of guilt). At the autonomous end, behavior is undertaken for its own sake (e.g., for the inner enjoyment, excitement, and interest that is inherent to the learning activity).

Motivation influences coping strategies by regulating the appraisal or experience of stress (Ntoumanis et al., 2009). In turn, motivation and stress appraisals lead to distinct coping responses. Students with autonomous motivation are more likely to use more engagement coping strategies, such as planning (Amiot, Gaudreau, & Blanchard, 2004; Thompson & Gaudreau, 2008), because their behavior is perceived to be initiated and caused by the self, and they thereby feel capable of influencing the outcomes. Students with controlled motivation are more likely to use disengagement coping strategies, such as using distraction, to avoid thinking about an important examination (Amiot et al., 2004; Schellenberg & Bailis, 2016), because the outcomes of their behavior are perceived to be determined by external influences.

### 1.3. Motivation, stress, and coping at university

The aforementioned research demonstrates that motivation predicts stress and coping. There is mixed evidence for these relationships in relation to short- and long-term outcomes of assessment, or to academic adjustment more broadly defined, and no research to date has integrated all of these factors in a single empirical model. This section presents evidence supporting the components of our model with three long- and short-term academic outcomes: vocational intentions, achievement, and affect. Examining students' intentions is essential because students are required to make academic choices according to their future vocational intentions early on. Past research has shown that future intentions of students are a key educational outcome that is related to other academic consequences, such as achievement and dropout (Bong, 2001; Otis, Grouzet, & Pelletier, 2005; Vallerand, Fortier, & Guay, 1997). In addition, long-term academic and career goals in adolescence are predictive of career attainment in mid-adulthood (Schoon, 2001), and have been related to domain-specific achievement (Schoon, 2001; Smith & Naylor, 2001; Titus, 2004). Positive and negative affects have also been shown to be an integral part of academic adjustment (Chemers, Hu, & Garcia, 2001; Gillet, Vallerand, Lafrenière, & Bureau, 2012; Zuckerman, Kieffer, & Knee, 1998).

Several studies have found that engagement and disengagement coping were predicted by intrinsic and extrinsic motivation, respectively (Amiot et al., 2004; Moneta & Spada, 2009). Motivation has been linked directly with academic outcomes, such as achievement, persistence, and positive affect (Ryan & Deci, 2000a; Taylor et al., 2014; Vallerand et al., 1997). Two experiments, for example, have demonstrated the impact of autonomous versus controlled motivation on assessment outcomes. In the first (Amabile, 1979), college art students painted less creative, and less

technically proficient pictures when they were told they would be evaluated. In the second (Grolnick & Ryan, 1987), elementary school pupils showed less depth of processing and less recall if they were told that the related tests were measures of their ability ('controlling' condition), and better conceptual learning and higher enjoyment if they were told the test was not a measure of their ability and that they could read the text however they wanted ('autonomous' condition). Assessments in general are known to be perceived as controlled regulation and thereby lead to anxiety, and ill-being (Ryan & Weinstein, 2009) through their thwarting of basic psychological needs. Autonomous motivation has been linked with the experience of positive affect and controlled motivations to negative affect in university assessment settings (Gillet et al., 2012). A recent systematic review indicated that autonomous goal motivation is positively linked to self-regulatory strategies such as effort expenditure and action planning (Gaudreau, Carraro, & Miranda, 2012). Self-determined motivation has repeatedly been linked with academic persistence and future vocational intentions (Lavigne, Vallerand, & Miquelon, 2007; Vallerand et al., 1997). In sum, the accumulated evidence that autonomous and controlled regulations impact the short- and long-term outcomes of assessment is strong (Ryan & Weinstein, 2009).

Few studies have examined the potential stress and coping mediators of the links between self-determined motivation and academic outcomes. Research has shown that high school students who experienced more autonomous motivation were more likely to have the intention to stay in school, that led them to persist in school at a higher rate (Vallerand et al., 1997). In addition, higher levels of autonomous motivation and higher GPA at the end of a semester have been linked with higher intentions to persist in school (Alivernini & Lucidi, 2011). Controlled motivation has been examined through stress appraisal and fear in relation to assessment. When teachers elicited controlled motivation by reminding students about the consequences of failure, students performed worse in examinations (Putwain & Remedios, 2014). von der Embse, Schultz, and Draughn (2015) compared the consequences of communicating controlled behavior through fear (reminding students of the consequences of an upcoming exam) with more autonomous behavior (offers to help with preparation). Students who were exposed to controlled behaviors performed worse than students exposed to efficacy appeals, and stress appraisals did not mediate this relationship. This suggests that another mediating factor such as coping might explain the relationships between controlled motivation and achievement.

Coping with university assessments requires considerable engagement with complex skills that need to be demonstrated in order to attain the desired outcomes. In achievement-related domains, engagement coping has been linked to deep and strategic approaches to preparation, while disengagement coping was linked to a more surface approach (Moneta, Spada, & Rost, 2007). Correlational studies have shown that engagement-oriented coping strategies are linked to positive affect (Ntoumanis, Biddle, & Haddock, 1999; Rovira, Fernandez-Castro, & Edo, 2005) and psychological adjustment (Amiot, Blanchard, & Gaudreau, 2008; Aspinwall & Taylor, 1992; Gaudreau & Antl, 2008; Verner-Filion et al., 2014). Engagement-oriented coping has also been associated with objective measures of achievement, such as higher GPA, as well as subjective measures, such as higher levels of performance satisfaction (Kaiseler, Polman, & Nicholls, 2009; Nicholls, Polman, & Levy, 2012; Schellenberg & Bailis, 2016; Zeidner, 1995). In the sports domain, van Yperen (2009) has found that engagement-oriented coping, past performances, and firm intentions to pursue a career in a premier league were important correlates of objective career success. More recently, engagement-oriented coping, but not disengagement-oriented coping, has been related to higher

achievement after one university semester (Schellenberg & Bailis, 2016). Conversely, disengagement-oriented coping has been related to negative outcomes such as increased burnout and lower levels of subjective well-being (Schellenberg, Gaudreau, & Crocker, 2013; Verner-Filion et al., 2014). In sum, research performed in educational and performance contexts mostly has agreed that engagement-oriented coping is associated with better academic and psychological outcomes.

#### 1.4. Gender differences in motivation, stress and coping

Previous research offers a reasonably reliable portrait of gender differences in the use of coping. In a meta-analysis of the effects of gender in stress and coping with various stressful encounters, Tamres et al. (2002) have found that women perceived events as more stressful and tended to use more coping strategies. But despite these gender differences in coping behaviors between males and females, studies in educational domains have consistently overlooked gender as a moderating variable of the outcomes of coping.

Mean-level gender differences have been found in motivation and coping. Most of the research in gender differences in coping with assessment has been performed in the sports domain, through competition. Women, as compared with men, generally perceive competitions as more stressful and feel that they have less control over their stress (Hammermeister & Burton, 2004; Kaiseler, Polman, & Nicholls, 2012; Kaiseler, Polman, & Nicholls, 2013). In line with the results of the meta-analysis on gender differences in stress and coping (Tamres et al., 2002), women in achievement situations tend to report more use of coping strategies as a whole (see also Anshel, Sutarso, & Jubenville, 2009; Crocker & Graham, 1995; Kaiseler et al., 2012; 2013; Kneel & Zuckerman, 1998; Ptacek, Smith, & Dodge, 1994; Rogowska & Kusnierz, 2012; Saklofske, Austin, Mastoras, Beaton, & Osborne, 2012). Comparatively fewer mean-level gender differences have been found in self-determined motivation measures. When such differences were revealed, females tended to score slightly higher on autonomous motivation and males slightly higher on controlled motivation (Ratelle, Guay, Vallerand, Larose, & Sénécal, 2007; Vallerand & Sénécal, 1992; Vallerand et al., 1997).

To our knowledge, no gender differences in the relationships between motivation and measures of stress and coping have been reported in past research. Two studies have investigated gender differences in the coping processes: Anshel et al. (2009) have found that both male and female athletes were likely to use engagement-oriented coping, and unlikely to use disengagement-oriented coping when facing social and performance stressors; Matud (2004) found that in both women and men, disengagement-oriented coping led to less adaptive psychological outcomes. Tamres et al.'s (2002) meta-analysis hinted that men gained more psychological benefits from the use of engagement-oriented coping strategies, but the evidence for this is limited.

#### 1.5. The present research

Using two studies conducted in educational settings, this research has three methodological and substantive objectives. First, we aimed at testing a proposed causal model of the structural relationships between motivation, stress, coping, and short-term and long-term academic outcomes (affect, achievement, and career intentions) in higher education. The second objective of the research was to assess gender equivalence of the coping models, particularly in relation to the outcomes of the coping process. Finally, we assessed the generalizability of the findings by examining motivation-coping-outcomes models across two independent samples.

Both studies used the same research design: a prospective study spanning one academic term, where motivation was measured at the beginning of the term, coping was measured in the middle, and outcomes at the end (for theoretical and empirical evidence supporting this sequence, see Amiot et al., 2004; Knee & Zuckerman, 1998; Ntoumanis et al., 1999, 2009; Skinner, Pitzer, & Steele, 2013; Thompson & Gaudreau, 2008). Study 1 examined these processes in a sample of music performance students facing public performances. Public performances in university settings are the favored way of assessing music students, and a jury evaluates these live performances. This specialized and homogenous domain allowed us to examine the impacts of motivation, stress appraisal, and coping with the stress of public assessments on the long-term outcome of career intentions—the extent to which college music students wanted to pursue a career in music performance. Study 2 generalized the findings of Study 1 with a sample of university students from various programs, where coping predicted midterm examination performance, as well as positive and negative affect. These students were recruited from programs with differing gender profiles, such as psychology (with a majority of women), mathematics and engineering (with a majority of men), and accounting (with approximately equal representation of men and women). Both studies examined gender differences in the means, variances and regression paths of the proposed model.

Based on the research reviewed above, we made the following hypotheses. *Hypotheses regarding the structural relations between the variables.* We hypothesized that autonomous motivation would relate positively to engagement-oriented coping and negatively to stress appraisal, while controlled motivation would relate positively to stress appraisal and disengagement coping. Furthermore, higher stress during the examination would negatively predict engagement coping and positively predict disengagement coping. We also hypothesized that engagement coping would positively predict intentions, achievement and positive affect, and that disengagement coping would negatively predict intentions, achievement, and positively predict negative affect. *Hypotheses regarding gender differences in the motivation-to-coping processes.* Since available evidence has overlooked gender differences in the motivation-to-coping processes, past research has seemed to assume that these links were gender-invariant (Amiot et al., 2004; Gaudreau et al., 2012; Ryan & Connell, 1989; Skinner et al., 2013). We therefore hypothesized that the links between motivation, stress and coping would be invariant. Mean-level gender differences were found in past research in levels of autonomous motivation and stress, females scoring higher on both (Tamres et al., 2002; Vallerand et al., 1997). We thus expected to find gender differences in autonomous motivation and stress. *Hypotheses regarding gender differences in the coping-to-outcomes processes.* Finally, since gender differences have been found regarding the ways of coping and their relations to outcomes, we also expect that the relations of coping to intentions, affect and achievement would differ between women and men. However, since this area of research has seldom been investigated, we do not have specific hypotheses regarding the directionality of these differences.

## 2. Study 1

Study 1 aimed to test a model linking motivation, coping, and career intentions of music performance students, and to examine whether there were gender differences in the relationship between coping and career intentions, in line with the aforementioned hypotheses. Studies have noted strong links between academic motivation and educational as well as vocational intentions (Lavigne et al., 2007; Lazarides & Watt, 2015; Wang, 2012), and that intentions are an important antecedent of future behavior

(Ajzen, 2001), including career success (van Yperen, 2009). Research has demonstrated that higher domain-specific motivation has a positive impact on students' vocational interests and choices (see Low, Yoon, Roberts, & Rounds, 2005). Finally, it is believed that maladaptive coping strategies, and increased stress, impede students' future intentions to stay on in a given career or educational path (Eicher, Staerklé, & Clémence, 2014). Since musical performances and assessments are inherently stressful (Steptoe, 1989), motivation, stress, and coping strategies may play a particular role in career intentions in this population.

### 2.1. Method

#### 2.1.1. Analytical approach

Data were analyzed using structural equation modeling and measurement equivalence. Goodness-of-fit of the measurement and structural models was evaluated according to the recommendations of Marsh et al. (2009): models were deemed to have acceptable fit with a comparative fit index (CFI) equal to or higher than .90 (and an excellent fit equal to or greater than .95) and a root mean square error of approximation (RMSEA) less than .08 (or less than .05 for an excellent fit), with the lower-bound confidence interval closest to zero (0) and the higher-bound confidence interval less than .10. The  $\chi^2$  values are also presented, a non-significant value indicating an excellent fit to the data. However, recent research has argued that  $\chi^2$  values are highly sensitive to sample size, and that the  $\chi^2$  values are almost always significant in moderately complex confirmatory factor analyses (Marsh, Hau, & Wen, 2004).

The models of the relations between motivation, stress, coping and outcomes, moderated by gender, were examined through structural equivalence (Byrne, 2012). Equivalence of the structural models was assessed in four models. *Model 1:* The models were tested using one single group to validate the structural relationship between the variables (Byrne, 1994, 2012; Byrne & van de Vijver, 2010). Model modification indices and error variances were also examined at this stage. *Model 2:* A second model was tested within a multiple-group framework, with all regression paths, means and variances constrained to be equal, thus testing for equivalence between genders (Byrne, 2012; Marsh, Nagengast, & Morin, 2013). *Model 3:* Only the regression weights on the paths directly related to the outcomes were freed to vary between males and females, to examine the hypothesis that the direct links between the predictors and outcomes differ between males and females. *Model 4:* Gender-equivalence in the estimated means and variances was tested by freeing the means and variances that contributed the most to the model, according to the model modification indices, theory, and past research.

To compare the adequacy of a more restrictive model in measurement invariance, we used several measures according to Chen (2007). A non-significant chi-square change ( $\Delta\chi^2$ ) indicates that the more constrained model fits the data as well as a less constrained model, and therefore that the models are equivalent. If the chi-square change statistics were significant and indicative of an ill-fitted model, we then examined changes in the other model fit indices between a less constrained and a more constrained model. Chen indicated that a change in CFI and TLI equal to or less than .010 complemented by a change of less than .015 in RMSEA would indicate a good model fit. In sum, a better model would be indicated by a stable or significant decrease in chi-square and RMSEA, and a stable or increase in CFI and TLI (Chen, 2007).

Finally, we used SEM to assess the equivalence of our measurement instruments between men and women in Sections 2.1.3 and 3.1.3. Measurement invariance relates to equivalence across gender at the structural (number and composition of factors), metric (factor loadings) and scalar levels (item intercepts; Byrne & van

de Vijver, 2010). Measurement invariance has been demonstrated in self-determined motivation and coping, so it appears unlikely that gender differences in measurement are strong (Gaudreau & Blondin, 2002; Grouzet, Otis, & Pelletier, 2006). Measurement invariance was assessed with the aforementioned thresholds (Chen, 2007). When invariance testing was successful, mean-centered factor scores of the variables were saved and those scores were used in the main analyses. All analyses were carried out using Mplus version 7.3 (Muthén & Muthén, 2010).

### 2.1.2. Participants

Participants were 296 music students who were part of a larger longitudinal study aimed at assessing the correlates of music performance and persistence. These students were recruited from various music classes in two colleges that offered specialized training in music. The study covered half a term of their college degree. Out of these students, two cases had missing values on all of the variables included in the present study, and 14 students did not specify their gender. These students were removed from the dataset. Out of the 280 students with valid entries, a preliminary analysis of outliers revealed 15 outlier cases (Standardized Mahalanobis Distance >  $\pm 2.5$ ). These outliers had particularly low scores on autonomous motivation as compared with their group means. The remaining analyses were performed with a sample size of 265, of which 151 were males and 114 were females. The students were aged 16–30 years ( $M = 18.06$ ,  $SD = 1.81$ ).

### 2.1.3. Measures

**2.1.3.1. Autonomous and controlled motivation (T-1).** We used a short version of the Academic Motivation Scale, college version (16 items; Grouzet et al., 2006; Vallerand et al., 1992; Vallerand et al., 1993) to measure students' level of motivation toward their music education. Participants rated items on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). Based on the motivation regulations inherent to SDT (Deci & Ryan, 1985; Ryan & Deci, 2000b), we measured four types of motivation: external regulation (e.g., "in order to have a better salary later on"); introjected regulation (e.g., "because I want to prove myself that I can succeed at school"); identified regulation (e.g., "because this will help me make a better career choice"); and intrinsic motivation (e.g., "For the pleasure I experience in broadening my knowledge about interesting subjects"). A second-order CFA supported the validity of the four motivation subscales as well as the division between autonomous motivation (intrinsic and identified regulations,  $\alpha = .66$ ) and controlled motivation (introjected and external regulations,  $\alpha = .80$ ),  $\chi^2(98) = 148.82$ ,  $p < .001$ ; CFI = .96; TLI = .95; RMSEA = .04 (.03, .06). Past research has also demonstrated the longitudinal and gender equivalence of the measure (Grouzet et al., 2006). In the present study, configural, metric and scalar measurement equivalence between genders was performed with the four motivation regulations, as Mplus does not allow for measurement equivalence testing of second-order factor analyses. The motivation scale was equivalent across gender at the scalar level, all  $\Delta\chi^2 p > .05$ , and the configural model fit the data adequately,  $\chi^2(196) = 259.30$ ,  $p = .002$ ; CFI = .95; TLI = .94; RMSEA = .05 (.03, .06).

**2.1.3.2. Stress appraisal (T-2).** Students were asked to evaluate on a 5-point scale ranging from 1 (very low) to 5 (very high) their perceived level of stress during general public music performance situations ( $M = 3.49$ ,  $SD = .97$ ). This measure was used as a proxy for stress under examination, as music performance examinations are usually public performances.

**2.1.3.3. Coping (T-2).** A 14-item version of the Brief Coping (Carver, 1997) was used to measure engagement and disengagement coping strategies. Students rated on a 5-point scale ranging from 1

(not at all) to 5 (very strongly) how each item matched how they were generally managing stress in public music performance situations. CFA results were adequate for the engagement–disengagement structure,  $\chi^2(140) = 268.60$ ,  $p < .001$ ; CFI = .92; TLI = .90; RMSEA = .06 (.05, .07). The six engagement items (e.g., "I've been trying to see the situation in a different light, to make it seem more positive") were taken from the active coping, planning, and positive reinterpretation subscales of the Brief Coping ( $\alpha = .78$ ). The eight disengagement items (e.g., "I've been turning to other activities to take my mind off things") were obtained from the subscales measuring denial, behavioral and mental disengagement, and self-blame ( $\alpha = .68$ ).

Configural invariance between gender fit the data adequately,  $\chi^2(277) = 389.18$ ,  $p < .001$ ; CFI = .92; TLI = .90; RMSEA = .06 (.05, .07). Metric and scalar invariance were met, with the chi-square difference test between the metric and the scalar levels being above the level of significance. In sum, measurement invariance was achieved with the Brief Coping by allowing one item loading to be freely estimated.<sup>1</sup>

**2.1.3.4. Career intentions (T-2).** This scale designed for the purpose of the present study assessed in 7 items on a scale ranging from 1 (strongly disagree) to 7 (very strongly agree), the extent to which music students wanted to pursue a career in music performance after their studies. CFA confirmed the presence of two dimensions, with an excellent model fit,  $\chi^2(32) = 44.83$ ,  $p = .07$ ; CFI = .96; TLI = .95; RMSEA = .06 (.00, .10). The first dimension encompassed music performance intentions (5 items, e.g., "I intend to play in a band/orchestra,"  $\alpha = .68$ ), and the second dimension covered music teaching (2 items, e.g., "I intend to become a primary/secondary school music teacher,"  $\alpha = .71$ ). Because we were interested in evaluating the musical intention of the music students, only the music performance future intention subscale was retained for further analysis. The measure of musical intentions was gender-equivalent at the scalar level, all  $\Delta\chi^2 p > .19$ .

## 2.2. Procedure

The participants completed surveys on two occasions across one academic term. On the first occasion, participants completed a consent form and a survey containing socio-demographic information and the autonomous and controlled motivation measures. On the second occasion, immediately following mid-term, they completed the stress appraisal measure, the engagement and disengagement coping measures, and the items relating to career intentions. The second occasion was two months after the first.

## 2.3. Results and brief discussion

Table 1 shows first-order correlations, means and standard deviation of the variables included in this study. The analyses were conducted using the four steps described in Section 2.1.1. Model fit indices for the four models are presented in the first section of Table 2. *Model 1:* We assessed the whole structural model in a single-group analysis framework. This model did not fit the data well. Model modification indices indicated that adding a direct link between autonomous motivation and career intentions would

<sup>1</sup> Metric invariance was not met, with four out of five of the fit indices being above the delta thresholds for equivalence. Modification indices indicated that freeing the factor loading of one engagement item ("I've been thinking hard about what steps to take") between men and women resulted in measurement equivalence between groups. With this partial invariance model, we further validated the scalar level of equivalence by constraining the items intercepts to equality and freeing the factor means.

**Table 1**

Means, standard deviations and correlations coefficients between the variables included in Study 1.

	1	2	3	4	5	6	M	SD
1. MotAut	–	.65***	.03	.23**	.11	.21**	.04	.65
2. MotCont	.69***	–	.12	.19*	.27***	.07	.02	.79
3. Stress	–.01	–.19*	–	.00	.25**	–.13	3.25	1.00
4. Enga	.27***	.24**	–.05	–	–.16*	.29***	.07	.63
5. Disenga	.01	.11	.23**	–.25**	–	–.11	–.06	.29
6. Intentions	.14	.07	.04	–.03	–.27***	–	5.33	2.08
M	.14	.10	3.77	.04	.06	4.03	–	–
SD	.67	.79	.84	.55	.28	2.14	–	–

Notes. N = 265. The upper diagonal is for the male sample (n = 151) and the lower diagonal for the female sample (n = 114). MotAut, MotCont, Enga and Disenga variables are mean-centered. MotAut = Autonomous motivation; MotCont = Controlled motivation; Enga = Engagement-oriented coping; Disenga = Disengagement-oriented coping; Intentions = Future career intentions.

\* p &lt; .05.

\*\* p &lt; .01.

\*\*\* p &lt; .001.

**Table 2**

Goodness of fit information for the multiple group path analysis across gender for Studies 1 and 2.

Model	$\chi^2$	DF	CFI	TLI	RMSEA (95% C.I.)	$\Delta \chi^2$	$\Delta DF$
<i>Study 1</i>							
M1a	9.89	5	.93	.80	.06 (.00, .11)		
M1b	5.27	4	.98	.94	.03 (.00, .10)	4.62*	1
M2	68.81***	31	.35	.42	.10 (.07, .13)	63.54***	27
M3	42.61*	27	.73	.72	.07 (.02, .10)	26.20***	4
<b>M4</b>	<b>24.76</b>	<b>26</b>	<b>1.00</b>	<b>1.02</b>	<b>.00 (.00, .07)</b>	<b>17.85***</b>	<b>1</b>
<i>Study 2</i>							
M1a	34.18***	12	.94	.87	.07 (.05, .10)		
M1b	14.84	11	.99	.98	.03 (.00, .07)	19.34***	1
M2	144.44***	47	.77	.74	.11 (.09, .13)	129.60***	36
M3	116.66***	40	.82	.76	.10 (.08, .13)	27.78***	7
<b>M4</b>	<b>46.01</b>	<b>36</b>	<b>.98</b>	<b>.97</b>	<b>.04 (.00, .07)</b>	<b>70.65***</b>	<b>4</b>

Notes. M1 = Single group Models; M2–M4 = Multiple group models based on the regression paths of M1b.  $\Delta$  = Differences in values between the preceding and the present model. M1a = Single group initial model; M1b = Single group model with direct regression paths added between autonomous motivation and career intentions (Study 1); and stress appraisal and negative affect (Study 2); M2 = Model with means, variances and regression paths constrained to equality; M3 = Model with regression paths between coping an outcomes freely estimated (both studies); M4 = Model with regression paths between coping an outcomes (both studies), means/intercepts of stress appraisal, career intentions, and disengagement coping (Study 1), and means/intercepts and variances of autonomous motivation and stress appraisal (Study 2), freely estimated. Models in bold typeface represent the final models.

\* p &lt; .05.

\*\*\* p &lt; .001.

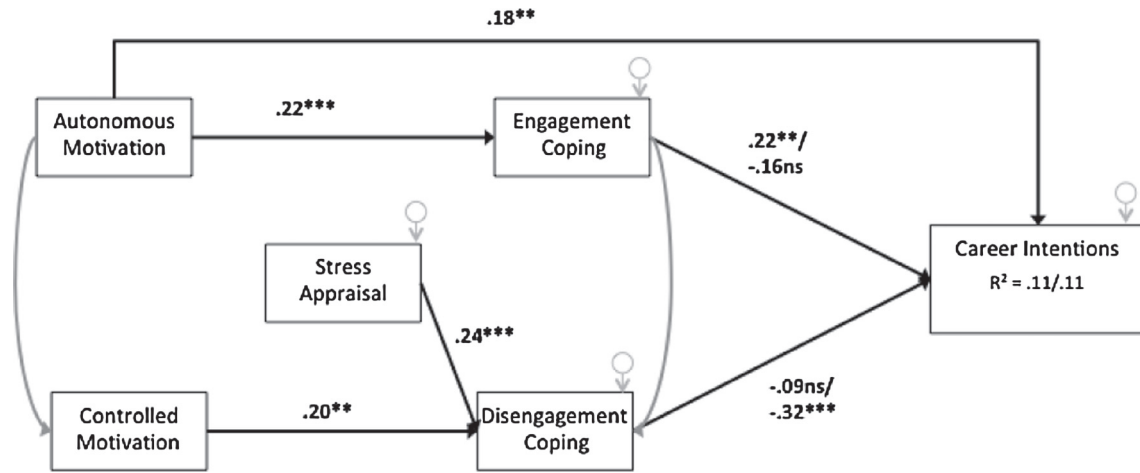
improve the model. Since this link was well-supported in previous research (e.g., Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004) it was then included in the model. This model fit the data adequately (Model 1b, in the first section of Table 2). In sum, the single-group analysis confirmed our theoretical model, with the addition of a direct link between autonomous motivation and career intentions.

**Model 2:** Taking Model 1b as the baseline, we evaluated the structural model in a multiple-group framework, whereby the regression paths, means and variances are constrained to be equal between males and females. This model did not fit the data well, meaning that the paths between females and males were significantly different. **Model 3:** We examined model fit where gender differences were modeled by freeing the regression weights between coping and career intentions, allowing them to differ between men and women. In this model, means and variances were constrained to be equal between men and women, except for the estimated mean-levels of stress, for which strong gender differences have been found in past research (Tamres et al., 2002). This model fit the data better but still did not meet the threshold of model adequacy.

**Model 4:** Finally, results of the modification indices indicated that freeing the intercepts of career intentions and disengagement coping would improve the model further. This model was an excellent fit to the data, and the standardized solution is presented in Fig. 1. Unstandardized beta coefficients, their standard errors, and standardized beta coefficients are presented in Table 3. The

following paths were equivalent across gender. Non-significant links between stress appraisal and the two forms of motivation were found. Engagement coping was predicted by autonomous motivation. Disengagement coping was predicted by controlled motivation and by stress appraisal. Gender differences were found on the link between career intentions and engagement coping. Whereas for males, a positive link was found between the use of engagement-oriented coping strategies and career intention, this link was not significant for females. Career intentions were predicted negatively by disengagement coping for females, but not for males and positively by autonomous motivation, similarly for males and females. Men and women differed in their levels of career intentions, men scoring higher than women (men:  $M = 5.21$ ,  $SE_M = .19$ ; women:  $M = 4.12$ ,  $SE_M = .21$ ). Men had lower scores on disengagement coping (men:  $M = -.31$ ,  $SE_M = .07$ ; women:  $M = -.23$ ,  $SE_M = .08$ ). Finally, women scored higher on stress appraisal (men:  $M = 3.25$ ,  $SE_M = .09$ ; women:  $M = 3.77$ ,  $SE_M = .10$ ).

Moderated mediation results were also found in the model. For men, autonomous motivation indirectly predicted career intentions through engagement-oriented coping, .16 (95% C.I. = .01; .31),  $z = 2.04$ ,  $p = .04$ . For women, disengagement coping mediated the link between controlled motivation and career intentions,  $-.17$  (95% C.I. =  $-.33$ ;  $-.01$ ),  $z = -2.13$ ,  $p = .03$ . Overall, this model explained 11% of the variance in career intentions for both men and women.



Notes. \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .  $N = 265$ . Standardized beta coefficients are presented. Only significant paths are shown. When gender differences are found, the upper side of the path is related to the coefficients for males, and the lower part for females.

Fig. 1. Study 1. Results of the multiple group path analysis linking motivation, stress, and coping processes leading to behavioral intentions of music students.

**Table 3**  
Study 1. Results of the unstandardized and standardized parameter estimates and standard errors of the direct paths between motivation, stress, coping, and career intentions, moderated by gender.

	<i>B</i>	<i>SE B</i>	$\beta$			
<i>Gender-equivalent results</i>						
MotAut → Stress	0.06	0.13	.04			
MotAut → Enga	0.20	0.06	.22***			
MotAut → Intentions	0.56	0.21	.18**			
MotCont → Stress	-0.06	0.11	-.05			
MotCont → Disenga	0.07	0.03	.20**			
Stress → Enga	-0.02	0.04	-.04			
Stress → Disenga	0.08	0.02	.24***			
	Males			Females		
	<i>B</i>	<i>SE B</i>	$\beta$	<i>B</i>	<i>SE B</i>	$\beta$
<i>Gender non-equivalent results</i>						
Enga → Intentions	0.78	0.31	.22**	-0.57	0.39	-.16
Disenga → Intentions	-0.65	0.66	-.09	-2.31	0.75	-.32***

Notes.  $N = 265$ . MotAut = Autonomous motivation; MotCont = Controlled motivation; Enga = Engagement-oriented coping; Disenga = Disengagement-oriented coping; Intentions = Future career intentions. \*  $p < .05$ .  
 \*\*  $p < .01$ .  
 \*\*\*  $p < .001$ .

In sum, Study 1 established relationships between motivation, stress appraisals, coping, and career intentions of music students in the context of music performance examination. Autonomous motivation was particularly relevant not only for the development of effective coping strategies, but also had a direct influence on students' career intentions. Controlled motivation resulted in the use of disengagement coping strategies. The model supported the relevance of coping strategies for career intentions in very stressful academic environments. As expected, gender differences were found in some means and in the predictive associations between coping and the outcome.

### 3. Study 2

The purpose of Study 2 was twofold. First, we wanted to generalize the predictive validity of the motivation-stress-and coping model by measuring the context of university assessment in a range of academic domains. The second aim was to confirm the

findings of Study 1 on gender differences in assessment performance as well as positive and negative affect.

#### 3.1. Method

##### 3.1.1. Analytical approach

The analytical approach was identical to Study 1 (see Section 2.1.1), in which gender invariance was first examined for each of the measures, followed by a procedure to establish structural relations and then differences in these relations.

##### 3.1.2. Participants

The sample of Study 2 comprised 350 students attending one single university in Quebec, Canada. They were enrolled in 13 different classes: 5 classes in engineering, mathematics and computer sciences (women = 11%), 3 in business and accounting (women = 60%), and 5 in psychology and health care (women = 81%). Out of these 350 students, five did not specify their

gender and three had missing values on all of the variables included in the core model. Out of the 342 valid entries, two outlier cases were identified that scored much lower in the examination than the other participants. These cases were removed from the dataset and the final sample comprised 340 participants, aged 19–57 years ( $M = 27.50$ ,  $SD = 7.40$ ), of which 136 were men and 204 were women.

### 3.1.3. Measures

**3.1.3.1. Academic motivation (T-1).** The same measure as in Study 1 was used. In the present study, participants rated on a 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree, the extent to which each of the statements corresponded to why they studied in their chosen program at university. A second-order CFA analysis supported the validity of the four motivation subscales (see Study 1),  $\chi^2(94) = 246.81$ ,  $p < .001$ ; CFI = .93; TLI = .91; RMSEA = .07 (.06, .08). The reliability coefficients for this second-order structure were, for autonomous motivation,  $\alpha = .77$ , and for controlled motivation,  $\alpha = .82$ .

Tests for measurement equivalence results indicated that the motivation scale was equivalent across gender at the partial scalar level, with all fit indices being within their threshold for invariance, except the chi-square difference that was significant for the difference between metric and scalar  $\Delta\chi^2(12) = 27.87$ ,  $p = .006$ .<sup>2</sup> Model fit information for the configural model is as follows:  $\chi^2(186) = 358.42$ ,  $p < .001$ ; CFI = .92; TLI = .90; RMSEA = .08 (.07, .09).

**3.1.3.2. Stress appraisal (T-1).** Students were asked to evaluate on a 5-point scale ranging from 1 = very low to 5 = very high, their perceived level of stress during exams ( $M = 2.99$ ,  $SD = 1.05$ ).

**3.1.3.3. Coping (T-2).** Coping was assessed immediately after the mid-term exam. Similar to Study 1, we administered the Brief Cope (Carver, 1997) to measure engagement and disengagement coping strategies, with the same rating scale. However, students were asked to evaluate the coping strategies used in preparation for this specific exam. CFA results confirmed the adequacy of the engagement-disengagement coping factors, with the same items included in each factor as in Study 1,  $\chi^2(162) = 328.92$ ,  $p < .001$ ; CFI = .92; TLI = .91; RMSEA = .06 (.05, .07). Alpha coefficients were  $\alpha = .78$  for engagement-coping, and  $\alpha = .73$  for disengagement-coping. Results of configural equivalence showed that the model was an acceptable fit to the data,  $\chi^2(324) = 550.43$ ,  $p < .001$ ; CFI = .91; TLI = .90; RMSEA = .07 (.06, .08). Metric invariance was confirmed, the changes in model fit information being within the thresholds (Chen, 2007). Scalar equivalence was also met for four out of five model fit indices (except chi-square difference).

**3.1.3.4. Positive and negative affect (T-2).** Immediately after the mid-term exam, students were asked to rate their mood state at present, using the Positive and Negative Affect Schedule (PANAS; Watson & Clark, 1999; Watson, Clark, & Tellegen, 1988). Participants rated, on a 5-point scale ranging from 1 (not at all) to 5 (extremely), the extent to which each of the 10 emotions included in the present study matched to the way they were feeling. Examples of items include “excited” and “proud” for the positive affect subscale ( $\alpha = .81$ ), and “distressed” and “irritable” for the negative affect subscale ( $\alpha = .86$ ). A CFA performed on the items confirmed the adequacy of a two-factor structure,  $\chi^2(31) = 74.14$ ,  $p < .001$ ; CFI = .96; TLI = .94; RMSEA = .08 (.06, .10). Configural and metric invariance were met, with the configural fit indices as follows:

<sup>2</sup> Partial scalar invariance with the intercept of the item “Because this will help me make a better choice regarding my career orientation.” allowed to be freely estimated, indicated a good model fit of the partial scalar invariance model,  $\Delta\chi^2(11) = 19.67$ ,  $p = .05$ .

$\chi^2(62) = 122.98$ ,  $p < .001$ ; CFI = .95; TLI = .92; RMSEA = .09 (.07, .12). The partial scalar invariance model indicated a good fit,  $\Delta\chi^2(7) = 8.71$ ,  $p = .27$ .<sup>3</sup>

**3.1.3.5. Achievement (T-3).** Results of the mid-term exams were collected from the courses tutors. Most of the results were given in percentage. One teacher graded the results in letters (ranging from A+ to F), and these results were converted back to percentage using the departmental memo on the grading system. Mid-term exams grades ranged from 23% to 100% ( $M = 75.80$ ,  $SD = 16.26$ ). We centered the students' grades around their course average, so that their scores represent the deviation from their own course's mean.

## 3.2. Procedure

This study spanned one academic term. Participants completed the first survey in their respective classes, along with a consent form, at the beginning of the term, and the second survey right after their class-related mid-term exam, one month later. In the consent form, students were asked their permission for the researchers to be provided with midterm examination results. These results were made available two months after the beginning of term. All questionnaires were answered in French.

## 3.3. Results and brief discussion

The same steps as in Study 1 were followed in the present study. Goodness of fit information for the four models is presented in the second section of Table 2. Correlation results, means and standard deviations are presented in Table 4. *Model 1:* The first single-group analysis model did not reveal an adequate fit to the data, that could be improved by adding a direct path between stress appraisal and negative affect (Ntoumanis et al., 1999). That is, our overall model was supported, with the addition of a direct path between stress and negative affect (*Model 1b*). *Model 2:* On the basis of this single group model, the multiple group, fully gender-equivalent, model did not fit the data well, confirming that the paths were not equivalent between genders. *Model 3:* The model in which regression weights between coping and the outcome variables (positive and negative affect, and examination results) significantly improved the model but still did not fit the data adequately. *Model 4:* An examination of the model modification indices revealed that allowing the estimated means/intercepts and variances of autonomous motivation and stress appraisal to be freely estimated between men and women would lead to an excellent model fit. This model was an excellent fit to the data.

The unstandardized and standardized beta coefficients, as well as standard errors are shown in Table 5 and the standardized results are displayed in Fig. 2. The regression paths presented next were gender-equivalent. Autonomous motivation positively predicted engagement coping. Controlled motivation was positively linked with both stress appraisal and disengagement coping. Stress was positively related to disengagement coping.

The associations between the predictors and outcomes were mostly gender non-equivalent. Positive emotions were negatively predicted by disengagement-oriented coping, with stronger associations for men than for women. The association between engagement-oriented coping and positive affect was not significant for men, and significantly positively related for women. Negative affect was positively associated with disengagement coping, and this relationship was stronger for men. The associations between negative affect and engagement coping were not significant for

<sup>3</sup> Partial scalar invariance was met when the intercept of the item “Hostile” that was freely estimated between groups.



**Table 4**  
Means, standard deviations and correlation coefficients between the variables included in Study 2.

	1	2	3	4	5	6	7	8	Mean	SD
1. MotAut	–	.31***	–.02	.33***	–.17*	.17*	–.14	.20*	–0.15	0.57
2. MotCont	.20**	–	.20*	.14	.20*	.03	.09	–.13	0.03	0.64
3. Stress	.12	.25***	–	.10	.32***	–.19*	.38***	–.33***	2.56	1.08
4. Enga	.19**	.10	.03	–	–.40***	.15	–.13	.24**	–0.01	0.78
5. Disenga	.07	.18**	.28***	–.53***	–	–.47***	.69***	–.72***	–0.05	0.19
6. PosEmo	.09	–.06	–.14*	.47***	–.46***	–	–.46***	.50***	0.01	0.61
7. NegEmo	.09	.29***	.42***	–.23**	.51***	–.66***	–	–.56***	–0.18	0.99
8. Results	.19**	–.06	–.07	.19**	–.30***	.31***	–.24***	–	0.48	16.33
Mean	0.09	–0.02	3.28	0.00	0.01	–0.02	0.01	–1.15	–	–
SD	0.45	0.60	0.92	0.73	0.22	0.67	1.06	13.30	–	–

Notes. N = 340. The upper diagonal is for the male sample (n = 136) and the lower diagonal for the female sample (n = 204). MotAut, MotCont, Enga, Disenga, PosEmo and NegEmo variables are grand mean-centered and Results is group-mean centered. MotAut = Autonomous motivation; MotCont = Controlled motivation; Enga = Engagement-oriented coping; Disenga = Disengagement-oriented coping; PosEmo = Positive Affect, NegEmo = Negative Affect; Results = Examination results centered around students' group means.

\* p < .05.  
\*\* p < .01.  
\*\*\* p < .001.

**Table 5**  
Study 2. Results of the unstandardized and standardized parameter estimates and standard errors of the direct paths between motivation, stress, coping, affect and examination results, moderated by gender.

	B	SE B	β			
<i>Gender-equivalent results</i>						
MotAut → Stress	0.02	0.12	.01			
MotAut → Enga	0.32	0.08	.23***			
MotCont → Stress	0.35	0.09	.20***			
MotCont → Disenga	0.05	0.02	.15**			
Stress → Disenga	0.06	0.01	.32***			
	Males			Females		
	B	SE B	β	B	SE B	β
<i>Gender non-equivalent results</i>						
Stress → NegEmo	0.12	0.10	.12	0.30	0.07	.27***
Enga → PosEmo	–0.03	0.11	–.03	0.28	0.07	.33***
Enga → NegEmo	0.16	0.15	.11	–0.01	0.11	–.01
Enga → Results	–0.82	2.24	–.04	0.86	1.77	.05
Disenga → PosEmo	–1.54	0.45	–.48***	–0.88	0.23	–.30***
Disenga → NegEmo	3.71	0.62	.71***	2.05	0.37	.44***
Disenga → Results	–61.71	9.93	–.78***	–16.12	5.68	–.26**

Notes. N = 340. MotAut = Autonomous motivation; MotCont = Controlled motivation; Enga = Engagement-oriented coping; Disenga = Disengagement-oriented coping; PosEmo = Positive Affect, NegEmo = Negative Affect; Results = Examination Results. \* p < .05.

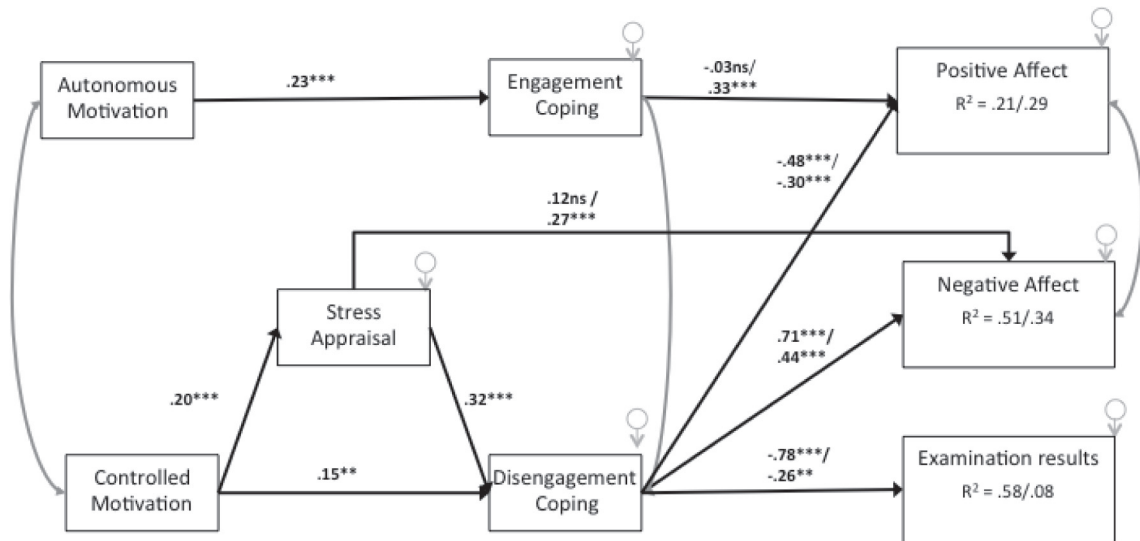
\*\* p < .01.  
\*\*\* p < .001.

men and women. Negative affect was not significantly linked with stress appraisal for men but positively associated for women. Examination results were more strongly predicted by disengagement coping for males than for females, with a very large negative effect of disengagement coping on the grade for males, and medium effects for females. The link between examination results and engagement-oriented coping was not significant.

We also found moderated indirect effects between the predictors and outcomes. For male students, the indirect effects between controlled motivation and examination results via stress appraisal and disengagement coping was significant,  $-1.37$  (95% C.I. =  $-2.47; -.27$ ),  $z = -2.85$ ,  $p = .004$ , and also via disengagement coping only,  $-3.24$  (95% C.I. =  $-5.39; -1.09$ ),  $z = -2.66$ ,  $p = .008$ . The links between controlled motivation and positive affect was mediated by stress appraisal and disengagement coping,  $-.03$  (95% C.I. =  $-.06; -.01$ ),  $z = -2.33$ ,  $p = .02$ , and also via disengagement coping only,  $-.08$  (95% C.I. =  $-.14; -.03$ ),  $z = -2.22$ ,  $p = .03$ . The associations between controlled motivation and negative affect were mediated by disengagement coping,  $.20$  (95% C.I. =  $.08; .31$ ),  $z = 2.64$ ,  $p = .008$  and a combination of disengagement coping and stress,  $.08$  (95% C.I. =  $.01; .15$ ),  $z = 2.82$ ,  $p = .005$ .

For female students, three indirect effects were found. First, autonomous motivation and positive emotions were mediated by engagement-oriented coping  $.09$  (95% C.I. =  $.01; .17$ ),  $z = 2.78$ ,  $p = .006$ . The associations between controlled motivation and positive affect was mediated by stress appraisal and disengagement coping,  $-.02$  (95% C.I. =  $-.04; -.001$ ),  $z = -2.44$ ,  $p = .02$ , and also via disengagement coping only,  $\beta = -.05$  (95% C.I. =  $-.09; -.01$ ),  $z = -2.32$ ,  $p = .02$ . Indirect effects were found between controlled motivation, stress and negative affect,  $.11$  (95% C.I. =  $.03; .19$ ),  $z = 2.94$ ,  $p = .003$ , controlled motivation, disengagement-oriented coping and negative affect,  $.11$  (95% C.I. =  $.01; .20$ ),  $z = 2.60$ ,  $p = .009$ , and finally controlled motivation, a combination of stress and disengagement-oriented coping, and negative affect,  $.05$  (95% C.I. =  $.01; .08$ ),  $z = 2.77$ ,  $p = .006$ .

In terms of mean-level differences, women had higher estimated scores on autonomous motivation (men:  $M = -.14$ ,  $SE_M = .05$ ; women:  $M = .09$ ,  $SE_M = .03$ ), and stress appraisal (men:  $M = 2.56$ ,  $SE_M = .09$ ; women:  $M = 3.29$ ,  $SE_M = .06$ ). This model explained 21% of the variance in positive affect for male students and 29% for females, 51% of the variance in negative affect for males, and 34% for female students, and 58% of the



Notes. \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .  $N = 340$ . Standardized beta coefficients are presented. Only significant paths are shown. When gender differences are found, the upper side of the path is related to the coefficients for males, and the lower part for females.

**Fig. 2.** Study 2. Results of the multiple group path analysis linking motivation, stress, and coping processes leading to affect and achievement in university students. Notes. \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .  $N = 340$ . Standardized beta coefficients are presented. Only significant paths are shown. When gender differences are found, the upper side of the path is related to the coefficients for males, and the lower part for females.

variance in examination results for men as compared with 8% for women.

An alternative model to the aforementioned main model was tested according to Gillet et al. (2012)'s empirical investigation, whereby the core model leading to coping would remain the same, but positive and negative affect would lead to performance (with the addition of gender non-equivalent regression paths between affect and performance). This alternative model did not fit the data as well as the preceding model,  $\chi^2(40) = 65.38$ ,  $p = .008$ ; CFI = .94; TLI = .92; RMSEA = .06 (.03, .09), and the parsimony fit indices favored the main model (Main Model AIC = 5036.77; Alternative Model AIC = 5048.13). Therefore, the main model (Model 4) was retained.

To sum up, three important findings were revealed from Study 2. First, the causal relationships found in Study 1 were replicated in Study 2, with the addition of a link between controlled motivation and stress. Second, the relationships between coping and outcomes were confirmed; disengagement-oriented coping was revealed to be an important predictor of negative outcomes. Finally, assessment of structural equivalence revealed strong gender differences, especially in the relationships between disengagement-oriented coping and outcomes.

#### 3.4. Equivalence of the core model across studies

To evaluate the structural equivalence of the core model between Study 1 and Study 2 we merged the two datasets with the variables included in both studies (autonomous and controlled motivation, stress appraisal, as well as engagement and disengagement coping; see Sections 2.1.2 and 3.1.2 for information about participants).

We performed a  $2 \times 2$  (Gender  $\times$  Study) structural equivalence SEM with the fully equivalent paths found in Study 1 and Study 2. We took the core model of Study 2 linking motivation to stress and coping as the main model to test for structural invariance (see Fig. 2) and the core relationships between the variables of the

model of Study 1 as the alternative model (see Fig. 1). We hypothesized that the regression model would be fully equivalent across studies and gender, as per the results of Studies 1 and 2. We standardized the variables so that the means and variances were comparable between samples, and tested for the equivalence of the regression paths only.

The fully equivalent model based on Study 2 fit the data very well,  $\chi^2(28) = 30.55$ ,  $p = .34$ ; CFI = .99; TLI = .98; RMSEA = .03 (.00, .08). As an alternative, the model presented in Study 1 was performed by removing the direct link between controlled motivation and stress appraisal. This model provided a less good fit to the data,  $\chi^2(29) = 37.81$ ,  $p = .13$ ; CFI = .95; TLI = .95; RMSEA = .05 (.00, .08). The parsimony adjusted AIC index favored the model based on Study 2 (Study 2 model AIC = 3789.79; Study 1 model AIC = 7127.64). In sum, measurement equivalence results comparing the two studies on the links between motivation, stress, and coping, confirmed gender invariance of those links, with a better fit to the pooled data obtained with the model presented in Study 2.

#### 4. General discussion

The findings from this research inform our understanding of the causal relationships between motivation, stress, coping processes, and the psychological outcomes of coping in the context of university assessment. In line with past research, we have examined our proposed model with three inter-related academic outcomes: affect, achievement and vocational intentions (Bong, 2001; Gillet et al., 2012; Lavigne et al., 2007; Schoon, 2001). We also addressed the need to examine gender differences in the magnitude of the relationships between coping and outcomes, have found large effects, and generalized the findings in two independent samples. Study 1 pursued these objectives in a sample of university music students, while Study 2 generalized these findings to other subject areas. The results largely supported the hypothesized model, which drew on our conceptual model adapted from Ntoumanis

et al. (2009) and on other previous research. Autonomous motivation predicted engagement coping strategies (Study 1 and Study 2), while controlled motivation predicted stress (Study 2) and disengagement coping strategies (Study 1 and 2). Coping strategies in turn predicted psychological outcomes: career intentions (Study 1), grades (Study 2), and positive and negative affect (Study 2). We examined gender differences in mean levels of coping and outcomes and the magnitude of relationships between coping and outcomes, and found large effects. Cross-validation results demonstrated the equivalence of the proposed model between studies.

#### 4.1. On the relationships between motivation, stress and coping with assessment

Our research performed with two independent samples confirmed the validity of a predictive model linking motivation, stress appraisal and coping. Autonomous and controlled motivation regulations were found to predict engagement coping and disengagement coping respectively, a link that has been connected similarly in previous research (e.g., Amiot et al., 2004; Doron, Stephan, Boich, & Le Scanff, 2009). Autonomous motivation results from a social environment that communicates a sense of competence, relatedness, and autonomy, and is characterized by behavioral regulation that is perceived to emanate from the self. In contrast, controlled motivation communicates a social environment that is more judgmental. Our findings corroborate a large body of evidence that autonomous motivation leads to engagement, while controlled motivation leads to stress and a focus on disengagement and avoidance. In the university context, and in education more broadly, the controlling and pervasive nature of assessments (Deci, Vallerand, Pelletier, & Ryan, 1991) may lead to broad negative impacts on students' adjustment. In the classical music tradition this is particularly salient. Classical music pedagogy has a long history of cultivating conformity and adherence to strict rules. While other domains of teaching (e.g., school) have changed considerably over the last century or so, the teaching style in studio classical music training is steeped in a master-apprentice model, in which the teacher is the active and prescriptive expert, and the student is passive (Gaunt, 2008; McPherson & Gabrielsson, 2002). Recent research has concluded that advanced classical music training might still be rather controlling (Evans, 2015; Syrjala, Saarela, & Lehtonen, 2005). The musicians investigated in Study 1 might have been affected by this overall culture of control. The students in Study 2 might also have experienced the more thwarting effects of lack of autonomy caused by the controlling context of university assessment.

The present research also made the unique contribution that autonomous motivation influences coping directly, and that controlled motivation directly predicts disengagement coping, but also works through stress and disengagement coping to predict academic outcomes. In theoretical terms, these findings show that motivation, coping, and outcomes can be brought together to better explain the outcomes of coping processes. In practical terms, students who attend university because they enjoy learning and are motivated by their own achievements are more likely to use more adaptive, engagement-oriented coping strategies, such as planning their assessment, and use positive cognitive reframing. On the contrary, students who attend university for more controlled reasons, for instance to please others or to have a better salary later on, are more likely to feel stressed and to use avoidance-oriented coping strategies, such as distracting themselves away from the assessment to avoid thinking about it. Our findings highlight that the motivation-stress-coping paths in turn influence academic adjustment as a result of university assessment.

#### 4.2. The impact of coping on assessment outcomes

Our study confirmed the benefits of the use of engagement-oriented coping and the thwarting effects of disengagement-oriented coping in reaching adaptive outcomes at university. In Study 1, men's vocational intentions were best explained by engagement coping, while disengagement coping more negatively impacted women's vocational intentions. In Study 1, women also tended to appraise music performances as more stressful than men. Past research has shown both that music performance is extremely stressful (Steptoe, 1989), and that musicians are more likely to drop-out in environments perceived as highly pressuring and stressful (Bonneville-Roussy, Vallerand, & Bouffard, 2013). In the present research, it is possible that women tended to react to their higher levels of performance-related stress by avoiding stressful situations, that in turn made them want to pursue an inherently stressful career in music less than men. In this sense, women's diminished career intentions may have been an adaptive response to the appraisal of high stress and the consideration that a career characterized by such stress is undesirable. In Study 2, disengagement predicted all outcomes, while engagement coping only predicted positive affect, and only for women. Disengagement-oriented coping involves less flexible and organized strategies that do not deal with the stressful situation directly (Skinner et al., 2003). As such, during assessment periods, students who use disengagement-oriented strategies may spend a significant amount of time away from the stressor, trying to avoid it, that lead them to experience less positive and more negative feelings and poorer objective grades as a result of their examination. This result was especially significant for men.

We also expected engagement coping to predict examination results, similar to the way that approach coping predicted results in Schellenberg and Bailis's (2016) study. However, engagement coping played a far smaller role in our results than disengagement coping. It is possible that our modeled gender effects clarified the relationships between the different ways of coping and outcomes. Had Schellenberg and Bailis's model accounted for gender differences in the outcomes of coping, they may have uncovered different results on the impact of disengagement coping. Nevertheless, our finding that disengagement-oriented coping strategies predicted less adaptive outcomes is in line with past research that has found similar results with regards to goal attainment and affect in athletic competitions (Amiot et al., 2004; Gaudreau & Blondin, 2002). Practically, our results support the findings that students who generally follow the more adaptive autonomous motivation and engagement-oriented coping path are also more likely to experience more positive affect, better grades, and long-term engagement with their studies.

#### 4.3. Gender differences in coping outcomes

Looking at gender differences in the outcomes of coping was a key objective in this investigation. First, the assessment of multiple group measurement equivalence is an important step to ensure that the questionnaires used are interpreted in similar ways between men and women. Our results revealed that both the Academic Motivation Scale and the Brief COPE were gender-equivalent. This means that both the motivation and coping measures used were understood and rated the same way by men and women in the present research. This result corroborates the findings of past research regarding gender-invariance of coping and motivation measures (Gaudreau, El Ali, & Marivain, 2005; Grouzet et al., 2006).

We hypothesized that the core of the model (structural relations between motivation, stress appraisal, and coping) would be gender-invariant. This assumption was grounded on the fact that

no gender difference, was reported in research that has specifically assessed these processes (Amiot et al., 2004; Gaudreau et al., 2012; Ryan & Connell, 1989; Skinner et al., 2013). We indeed found that all of the motivation-to-coping processes were equivalent among our female and male student samples, also across studies, and in line with the results of past research. That is, autonomous motivation predicted engagement-oriented coping, whereas controlled motivation was associated with stress-appraisal and disengagement-oriented coping.

We found mean-level differences in the estimated measures of stress appraisal, disengagement coping and career intentions in Study 1 and autonomous motivation and stress appraisal in Study 2, females scoring higher on most of these measures (except career intentions). The fact that women tend to score higher on stress and coping measures has been well documented in past research (Matud, 2004; Tamres et al., 2002). Females experiencing higher levels of stress may be prone to use more coping strategies, including disengagement coping, to try to face the increased stress. The estimated mean of autonomous motivation was found to be higher for females in Study 2, only, replicating the results of past research (Vallerand et al., 1997). The means of all other variables were found to be equivalent across gender. Therefore, finding such strong similarities in most of the means between male and female students in the motivation-to-coping processes suggests that it will be fruitful for educational researchers to explore other mechanisms that might explain the strong gender differences found in the outcomes of coping.

We found that disengagement-oriented coping explained most of the gender differences in outcomes. This result was surprising, since past research has found mixed to no gender differences in the effectiveness of the coping strategies in achievement domains (Lawrence, Ashford, & Dent, 2006; Nicholls, Polman, Levy, Taylor, & Cobley, 2007; Ptacek et al., 1994). Disengagement coping particularly affected men's performance on examinations in the present study: One unit increase in disengagement-oriented coping directly translated into a failure for male students with a loss of 61 points, but for females the loss was only 17 points. This difference is surprising given that the examinations occurred under similar circumstances and that women experienced more stress in relation to examinations. One hint of explanation can be found in research that suggests that women tend to seek social support much more than men (e.g., Lengua & Stormshak, 2000; Matud, 2004; Ptacek et al., 1994). Although seeking support has been theoretically associated with engagement coping (e.g. Gaudreau & Blondin, 2002) and with emotion-oriented coping (that sometimes is associated with disengagement coping; e.g. Nicholls & Polman, 2007), others have emphasized on its overall adaptive nature in dealing with stressful situations (Skinner et al., 2013). In addition, research has found that, from a young age, female students were more likely to use self-regulation strategies, such as planning and monitoring, than male students (Zimmerman & Martinez-Pons, 1990). Therefore, women might use social support and self-regulation strategies to buffer the negative effects of stress and disengagement-coping strategies much more than men, for instance by seeking ways to increase their overall study effectiveness. The moderating roles of social support and self-regulation to explain the links between disengagement-oriented coping and outcomes are interesting avenues for future research.

Engagement-oriented coping strategies were also a source of gender differences, but led to mixed results in the present research. With our specialized sample of musicians, the use of engagement coping strategies, such as planning, predicted future musical career intentions in the sub-sample of men. This result supports the hypothesis that males might benefit the most from the use of engaging strategies. With our general sample of students in various domains, we found little effects of engagement-oriented strategies

on the outcomes, except for its effect on positive affect. That is, engagement-oriented coping strategies were linked to the experience of positive affect right after an examination much more for women than for men. This variable on its own explained 15% of the gender differences between men and women on the coping-to-positive affect links. Tamres et al. (2002) also found that the use of engagement-oriented coping could benefit women more in situations where the outcome is associated with greater perceived control and lower perceived threat. In the present study, it is possible that women who experienced the greater increase in positive affect as a result of using engaging strategies also experienced greater control and less threat during their mid-term examination. In sum, our results show that gender differences on the links between engagement-oriented coping and outcomes lead to inconclusive results as to which gender benefit the most from this type of coping strategy. On the other hand, our results clearly show that disengagement-oriented strategies lead to less adaptive outcomes in educational contexts, especially for men. Studying gender differences in the use and effectiveness of these types of strategies with various research designs and outcomes is likely to be a fertile avenue for future research.

#### 4.4. Practical implications

Our findings support the importance of promoting autonomous motivation and engagement-oriented coping strategies in educational and achievement settings. These results can provide a structure for universities to design policies that acknowledge the importance of fostering adaptive responses to stress, especially in examination periods. Our results can be helpful in creating professional development programs that would help educators support autonomous motivation of their students, by focussing on the learning processes rather than the grades, and on providing students with “toolkits” of engagement-oriented coping strategies to use during assessment periods. Although our results were especially striking for male students, we believe that promoting the use of adaptive coping strategies would also be beneficial to female students, who are more likely to perceive assessment and examinations as stressful.

#### 4.5. Limitations and future directions

There are limitations of the current study that might lead to interesting areas for future research. First, most of the measures included in the present research were self-reported. Fortunately, these measures were substantiated by objective measures of achievement, and the mostly consistent findings reported in the cross-validation facilitate the generalization of the findings. An exception to this was the high correlation coefficient found between autonomous and controlled motivations in Study 1. Future research should further investigate the validity of autonomous and controlled motivations with musicians. In addition, the present studies spanned several weeks and thus attrition was to be expected. The attrition rates were consistent with those reported in past research involving similar populations, but attrition can reduce the power of the effects found in the studies. Future research is needed to replicate our findings with larger sample sizes and with research designs spanning a longer period of time to ensure the generalization of the findings. Including more environmental factors, such as measures of autonomy-supportive and controlling environments in future research could provide a broader picture of the determinants of motivation and coping in educational contexts. Future research should also clarify the relationships between engagement and disengagement-oriented coping, and we draw particular attention to the large effect of disengagement coping on examination performance for men, that

needs to be further investigated. In addition, using experimental study designs to evaluate the roles of motivation and coping in controlled environments could help further understand the mechanisms underlying gender differences in the coping-to-outcome processes. Finally, the measure of coping used did not include all the possible coping strategies used in evaluation contexts. Future research should examine the coping processes with broader and more varied measures of coping strategies.

## 5. Conclusion

The present research provides strong support for a model linking motivation, coping and outcomes in educational contexts. Evaluations are inherently stressful for students in higher education and our research clearly shows adaptive and maladaptive paths toward academic outcomes. In particular, our research revealed that controlled motivation predicted more negative outcomes through higher appraisals of stress and the use of disengagement-oriented strategies to cope with that stress. The gender differences we found in this research highlight the potential divergent processes men and women go through when facing stressful academic situations. Specifically, we highlighted the distinctive roles of disengagement-oriented strategies in predicting academic outcomes in men and women. The use of disengagement-coping strategies was particularly detrimental to the academic adjustment of male students, who saw their grades dramatically decrease as a result of using such strategies. Since the moderating role of gender has been overlooked in past research linking motivation and coping to academic outcomes, our research opens new areas for future research.

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