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ISSN 1577-7057

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IJP&PT

INTERNATIONAL JOURNAL OF PSYCHOLOGY & PSYCHOLOGICAL THERAPY

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<https://www.ijpsy.com>

Volume 21, number 3, October 1, 2021
Volumen 21, número 3, 1 Octubre, 2021

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© 2021 AAC, ISSN 1577-7057

Publicada por/Published by: **Asociación de Análisis del Comportamiento (AAC, Madrid, España) & Madrid Institute of Contextual Psychology (MICPSY, Madrid, España)**

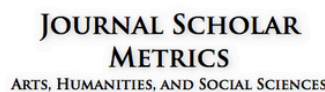
Depósito legal: GR-1332-2001

Printed on / Impreso en: **Copias Centro, Madrid (España)**

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Coping Strategies and Academic Motivation: The Mediating Effect of Achievement Emotions

Jitka Vaculíková

Tomas Bata University in Zlín, Czech Republic

ABSTRACT

The current study seeks to determine whether different achievement emotions (positive and negative) mediate the relationship between coping strategies (proactive and preventive coping) and academic motivation in a representative sample of the Czech adult population ($N= 1,025$). A cross-sectional research design featuring path analysis was used to explore the mediated effects of theoretical models. The results revealed that positive achievement emotions (i.e. enjoyment, hope, and pride) work well as moderators between positively future-oriented coping behavior and motivation to study. However, model fit, including mediating role of negative achievement emotions (i.e. anger, anxiety, shame, hopelessness, and boredom) as moderators, was very poor. Moreover, the measurement invariance of the data-fitting model of positive emotions indicated that the same construct was being measured across gender and age groups. Finally, implications of the findings regarding mental health promotion, limitations of the study, and future research are discussed.

Key words: proactive and preventive coping, achievement emotion, academic motivation, path analysis, measurement invariance.

How to cite this paper: Vaculíková J (2021). Coping Strategies and Academic Motivation: The Mediating Effect of Achievement Emotions. *International Journal of Psychology & Psychological Therapy*, 21, 3, 363-378.

Novelty and Significance

What is already known about the topic?

- Emotions and motivation are inseparable in the context of learning and performance and interplay with cognitive processes. Positive emotions such as enjoyment, hope and pride function as positive activating stimuli.
- High levels of hopelessness or boredom would most likely deactivate behavior, reduce motivation, and negatively influence overall performance.
- Presented structural models including description of those directed dependencies have not been fully tested to date, as neither model involved a representative sample of adult population.

What this paper adds?

- Positive achievement emotions (i.e. enjoyment, hope, and pride) serve well as moderators between positively future-oriented coping behavior and motivation to study.
- The path model is invariant according to gender and age, indicating the possibility to expect the same set of coefficients for males and females and for the different age of participants.
- Negative achievement emotions (i.e. anger, anxiety, shame, hopelessness, and boredom) do not work well as moderators of the relationship between coping strategies and academic motivation.
- The path model expecting that coping strategies are negatively related to negative achievement emotions, which in turn negatively influence academic motivation was not significant.

Emotions are present at almost all times across life and unfold in the context of a situation that may support or reduce one's resources to engage in present activity such as learning and performance (e.g. Méndez Aguado, Aguilar Parra, Álvarez, Trigueros, & Fernández Archilla, 2020; Kim & Hodges, 2012; Pekrun, Goetz, Titz, & Perry, 2002). They have a particularly strong impact on attention and highly influence action motivation and behavior (Tyng, Amin, Saad, & Malik, 2017). A remarkable amount of research has found that emotions and motivation are inseparable in the context of both

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learning and performance (e.g. Kim & Pekrun, 2014; Op't Eynde & Turner, 2006) and in fact can be seen as “two sides of the same coin” (Buck, 1985, p. 396). Emotions and motivation further interplay with cognitive processes (Hannula, 2006; Op't Eynde, Corte, & Verschaffel, 2006); they influence valence (positive vs. negative) and the activation (activating vs. deactivating) of emotions as well as effect the promotion of (sustainable vs. poor) motivation. For example, high levels of hopelessness or boredom would most likely deactivate behavior, reduce motivation, and negatively influence overall performance. On the other hand, positive emotions such as enjoyment, hope and pride function as positive activating stimuli due to the high intensity of the physiological emotional reactions involved (Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011). Positive emotions promote motivation, support self-regulation as well as positively affect behavior and performance. Further, emotions that occur frequently and represent the negative activating category (anger, anxiety, and shame) may reduce intrinsic motivation, but they can also strongly underpin the extrinsic motivation that provides support for the effort to avoid failure and thus they likely offset negative effects on performance.

Psychological and motivational processes can be highly influenced by the individual's coping strategies, i.e. the appreciation of the stressful events or upcoming difficult situations as challenges rather than threats. Proactive coping is a stress-management strategy that reflects efforts to effectively deal with life stressors and facilitate goal attainment and personal growth (Aspinwall & Taylor, 1997). In proactive coping, individuals see demands and risks as opportunities in the distant future and thus they initiate constructive activities toward meeting goals. Individuals build up resources that facilitate promotion toward challenging goals and enable people to reach full potential (Aspinwall & Taylor, 1997).

In accordance with Greenglass (2002), proactive coping is seen as a future-oriented process targeted towards goal management rather than risk management, which involves positively driven motivation. Empirical research has demonstrated that proactive coping is associated with positive affect (self-rated positive mood) that, in turn, is expected to relate to better psychological functioning (Greenglass & Fiksenbaum, 2009). Greenglass, Fiksenbaum, and Eaton (2006) reported that proactive coping is negatively associated with depression in various samples (i.e. Almássy, Pék, & Papp, 2014; Uskul & Greenglass, 2005; Vaculíková, 2016). Proactive coping was also shown to improve general well-being and satisfaction (Aspinwall & Taylor, 1997), and it positively predicts organizational outcomes such as job performance, job satisfaction, and organizational citizenship behavior (Ersen & Bilgiç, 2018). In terms of structural equation modelling, a proactive coping subscale as measured by the Proactive Coping Inventory (PCI; Greenglass, Schwarzer, & Taubert, 1999) based on a sample of college students showed a fully mediated relationship between stress and student work-engagement (Gan, Yang, Zhou, & Zhang, 2007), and a partially mediated relationship between positive psychological states (optimism and self-esteem), and the anxiety of undergraduate students (Griva & Anagnostopoulos, 2010). Moreover, Vaculíková and Soukup (2019) declared that proactive coping analyzed as overall PCI score based on a sample of full-time university students functioned as a partial mediator between social support and well-being. Moreover, the results from a community sample of adults revealed that the interaction of proactive coping with the tendency of an individual to act impulsively under the pressure of negative emotions is associated with depression scores (Altan-Atalay & Zeytun, 2020).

Previous studies have suggested that adult men and women cope differently with stressors (Feldman, Fisher, Ransom, & Dimiceli, 1995; Nolen-Hoeksema, 1991; Piko,

2001). According to Wilson, Pritchard and Revalee (2005), individual differences in adolescent health represented by coping proved significant by gender. More specifically, physical and psychological health symptoms (e.g. anger, depression, tension, negative moods) as well as coping styles varied significantly in men and women. Besides gender, research findings suggest that age influences the ways of coping (Feldman et alia, 1995; Folkman, Lazarus, Pimley, & Novacek, 1987; Frydenberg & Lewis, 1993; Monteiro, Balogun, & Oratile, 2014). A path analysis performed by Chen, Peng, Xu, and O'Brien (2017) tested a hypothesized mediation model of a direct path from age to positive affect (i.e. excited or inspired emotions) and the indirect path from age to problem-focused coping as well as from this coping variable to positive affect. Results have shown that problem-focused coping mediates the relationship between age and positive affect. Further, older adults were less likely to use problem-focused strategies in a stress context and experienced lower levels of positive affect.

Nevertheless, a less research literature has been devoted to the mediating role of achievement emotions in relation to coping strategies and the resultant academic motivation in adult population. The mediating effect of emotions between proactive coping and the motivation to study at university or at another type of school (higher than compulsory primary) has not yet been fully examined. For these reasons, we decided to fill this gap in the literature by empirically assessing the existing theoretical frameworks which attempt to describe the influence of coping strategies on academic motivation mediated by achievement emotions. The purpose of the present study was to use a structural model to test whether positive achievement emotions (Model A), and negative achievement emotions (Model B) are a significant mediator of the relationship between coping strategies (proactive and preventive coping) and academic motivation. We also aim to evaluate the measurement invariance of the models in terms of gender as well as across different age categories. More specifically the path models tested the following hypotheses: (1) positive achievement emotions are a significant positive mediator between coping strategies and academic motivation (Model A), it is expected that coping strategies are positively associated with positive achievement emotions, which in turn positively influence academic motivation; (2) the activation of negative achievement emotions is a significant negative mediator between coping strategies and academic motivation (Model B), it is expected that coping strategies are negatively related to negative achievement emotions, which in turn negatively influence academic motivation; (3) gender-related differences exist in all the observed model relationships; and (4) age-related differences exist in all the observed model relationships.

METHOD

Participants

The study sample covered a representative sample of the Czech adult population ($N= 1,025$), with the quota selection based on the respondents' gender, age, education, place and region of residence. Within the defined quotas the respondents were selected randomly by CAPI until the quota was met. the sample of participants was composed of 495 males (48%) and 530 females, with an average age of 47 years (span 18 to 87, $SD= 16.94$ years) were included in this study. Most participants had acquired secondary education either without a school-leaving examination (37%) or with a school-leaving examination (34%). Sixteen per cent of the respondents had achieved elementary education and 13% were university graduates. The most heavily represented regions included South

East (16%) and North East (14%) and capital city Prague (13%). Representation from the other regions was between 11-12%.

Instruments and Measures

Proactive Coping Inventory (PCI; Greenglass *et alia*, 1999; Czech version Šolcová, Lukavský, & Greenglass, 2006) The original PCI consists of seven future-oriented subscales, but only the highly relevant proactive coping subscale (14 items; $\alpha = .76$), example item “I like challenges and beating the odds,” and the preventive coping subscale (10 items; $\alpha = .75$), example item “I plan my strategies to change a situation before I act,” were used in this study. Items related to possible responses to multiple situations and the various respondents were gauged to explain how true the statements were for them, i.e. based on their subjective judgments about their response to the given situation. The most appropriate variant was expressed in numbers from 1 through 4 with meanings of 1 (not at all true), 2 (barely true), 3 (somewhat true), and 4 (completely true), with a higher value indicating a higher level of coping behavior. Selection of the PCI subscales was based on a declared positive association of the disposition to cope proactively with psychological constructs, such as well-being (Hyun & Ku, 2020; Uskul & Greenglass, 2005), personal growth (Rogalla, 2020), emotional approach (Stanton, 2011), or job enjoyment and performance (Önder & Reyhan, 2018). Accordingly, proactive strategies have been found to contribute to reduction of depression (Uskul & Greenglass, 2005), anxiety (Griva & Anagnostopoulos, 2010), hopelessness (Tokem & Özcelik, 2015), as well as stress emotions (Lazarus, 1999). Based on those findings, it was expected that proactive copers with a sense of having the situation under control achieve more positive activating emotions that enhance their motivation to study.

Achievement Emotions Questionnaire (AEQ; Pekrun *et alia*, 2011). The learning related emotion subscales (75 items) of the AEQ were designed to represent the affective, cognitive, motivational, and physiological components of emotion. Emotions classification considers valence and activation, whereas the positive activating emotions include enjoyment (10 items; $\alpha = .78$; i.e. “I enjoy acquiring new knowledge”), hope (6 items; $\alpha = .77$; i.e. “I have an optimistic view toward studying”), and pride (6 items; $\alpha = .75$; i.e. “I’m proud of my capacity”). Negative activating emotions are represented by anger (9 items; $\alpha = .86$; i.e. “Studying makes me irritated”), anxiety (11 items; $\alpha = .84$; i.e. “I get tense and nervous while studying”), and shame (11 items; $\alpha = .86$; i.e. “I feel ashamed that I can’t absorb the simplest of details”), with negative deactivating emotions comprising hopelessness (11 items; $\alpha = .90$; i.e. “I feel hopeless when I think about studying”), and boredom (11 items; $\alpha = .92$; i.e. “The material bores me to death”). Achievement emotions are based on the situational context of academic settings, such as attending class, studying, and taking tests and exams with temporal specificity of before, during or after the situation of attending class, studying, or taking tests and exams, respectively. Only learning-related emotions were part of this study. The submitted questionnaire identified how respondents experienced emotions during learning, which was meant as an intentional and planned process (not an involuntary learning that comes unintentionally), with not only formal but also non-formal learning evaluated. Respondents considered the typical situations they experienced during their learning regime, and they selected the most appropriate answer on the 4-point Likert scale ranging from 1 (completely disagree) to 4 (completely agree). In line with expectations (Pekrun *et alia*, 2011), the positive activating emotions correlated positively with intrinsic motivation, effort, elaboration of learning material, and self-regulation of learning. Contrarily, the negative deactivating emotions were demonstrated through a more complex pattern of linkages. All three emotions, anger, anxiety and shame, correlated negatively with intrinsic motivation and anxiety, with shame correlating positively with student extrinsic motivation. Taken together, students benefit from positive activating emotions, whereas negative deactivating emotions are likely to be detrimental to successful learning and performance. Thereby, we hypothesized that positive emotions would be a significant mediator between proactive coping and academic motivation, and would be positively related to academic motivation. On the other hand, negative emotions were predicted to be a significant mediator between

proactive coping and academic motivation, while negative activating emotions would share a negative relationship with intrinsic motivation. At the same time negative deactivation was expected to show a positive correlation with the other aspects of the motivation outcome, i.e. identified and external regulation, and amotivation.

Academic Motivation Scale (AMS; Vallerand *et alia*, 1989). Selected scales of the Czech version of the AMS (Vaculřková, 2019) were used to measure academic motivation. Based on the explanatory factor analysis, a 4-factor model was generated which covered 16 items which create intrinsic motivation (3 items; $\alpha = .60$; i.e. "Because I think that this activity is interesting"), identified regulation (5 items; $\alpha = .82$; i.e. "Because I am doing it for my own good"), external regulation (4 items; $\alpha = .67$; i.e. "Because I am supposed to do it"), along with a amotivation subscale (4 items; $\alpha = .74$; i.e. "There may be good reason to do this activity, but personally I don't see any"). All items included the question "Why did you study at the university or at other (higher than compulsory primary) school?" which was to be answered by selecting a response from a 7-point Likert scale ranging from 1 (does not correspond at all) to 7 (corresponds exactly).

Data Analysis

An introductory cross-sectional data analysis included descriptive statistics (i.e. number of items, means, standard deviation) and an internal consistency evaluation using Cronbach's α and McDonald's ω . The linear relationships as well as the uniform scale of the individual motivation subscales were checked using Pearson's zero-order correlation. The analyses were performed using IBM SPSS Statistics 24.

Next, complex SEM models were calculated to test for mediated effects using IBM SPSS AMOS 24. A series of measurement invariance tests to determine whether the model structure was equivalent across two groups of gender were realized. Based on the common recommendations for determining the model goodness of fit (Hooper, Coughlan, & Mullen, 2008), the primary indicators included measures of incremental fit represented by the *Comparative Fit Index* (CFI; Bentler, 1990), and the *Tucker-Lewis Index* (TLI; Tucker & Lewis, 1973), and the informative fit measure was described by the *Root Mean Square Error of Approximation* (RMSEA; Steiger, 1990). A chi-square (χ^2) statistic, *degrees of freedom* (*df*) and the related *p* value (Kline, 2005) were presented. Lastly, the *Bayesian Information Criterion* (BIC) for the tested and saturated model was compared, and the *coefficient of determination* (R^2) was used to evaluate model's explanatory power.

RESULTS

The means of the PCI and AEQ subscales ranged above the central point of the 4-point Likert scale, with a higher value representing a higher level of the phenomenon measured by the subscale. Out of these, hopelessness reached the lowest value of $M = 2.067$, and preventive coping reached the highest value ($M = 2.705$) with satisfactory dispersion based on the *SD*'s values of all coping and emotions subscales below 1. Further, the means of the AMS subscale ranged from 3.149 to 4.541 out of 7 with *SD*'s between 1.246 and 1.580. As there are different variances for the individual scales, we used standardized coefficients for all path models.

Before performing data analysis, the internal consistency for all scales was checked. Individual subscales reached sufficient values except for the two items from the Proactive coping subscale. Item "I try to let things work out on their own" (reversed item), and item "I often see myself failing so I don't get my hopes up too high" (reversed item), did not correlate to the other items, and were thus excluded from the subscale. Results

of internal consistency measurements (McDonald's ω and Cronbach's α) together with descriptive statistics can be seen in Table 1. The internal consistency for all subscales was reasonable ($>.70$), with most values higher than $.80$ creating consistent subscales.

Table 1. Descriptive Statistics of the Individual Subscales Including Reliability Coefficients (N= 1,025).

Subscale	N°	Max.	M (SD)	ω	α	95%IC		
						Lower	Upper	
Coping (PCI)	Proactive coping	11	4	2.611 (.491)	.887	.884	.873	.894
	Preventive coping	10	4	2.705 (.484)	.847	.842	.828	.856
Emotions (AEQ)	Enjoyment	10	4	2.616 (.615)	.912	.911	.903	.919
	Hope	6	4	2.597 (.628)	.876	.875	.863	.886
	Pride	6	4	2.639 (.592)	.838	.839	.822	.853
	Anger	9	4	2.207 (.623)	.897	.896	.886	.905
	Anxiety	11	4	2.242 (.546)	.883	.881	.869	.891
	Shame	11	4	2.157 (.514)	.863	.861	.848	.874
	Hopelessness	11	3.82	2.067 (.581)	.900	.897	.888	.906
	Boredom	11	4	2.367 (.625)	.913	.911	.902	.919
Motivation (AMS)	Intrinsic motivation	3	7	4.300 (1.580)	.877	.876	.862	.889
	Identified regulation	5	7	4.541 (1.502)	.921	.921	.913	.928
	External regulation	4	7	3.722 (1.357)	.787	.783	.760	.804
	Amotivation	4	7	3.149 (1.246)	.715	.707	.676	.735

Notes: α = Cronbach's α ; N°= number of items; M= mean; SD= Standard Deviation; 95%IC= 95% Confidence α interval; ω = McDonald's ω .

Correlations for the AMS subscales, the SEM models outcomes, are presented in Table 2. According to the original assumption, all motivation subscales were to create one scale (Academic Motivation Scale). However, the correlation results contradicted

Table 2. Zero-order Correlation for Individual Motivation Subscales.

Subscales (AMS)	Intrinsic motivation	External regulation	Identified regulation
External regulation	.312**		
Identified regulation	.894**	.406**	
Amotivation	-.050	.476**	-.050

Note: **= $p < .01$.

this assumption. The amotivation subscale was not related to the intrinsic motivation and identified regulation subscale, and only moderately correlated to the external regulation subscale. Further, the subscale measuring external regulation reached only a moderate relationship with the intrinsic motivation and identified regulation subscale. On this basis, we decided to use only strongly correlated intrinsic motivation and identified regulation subscales as the final SEM models outcome and proxy indicator of academic motivation. Furthermore, correlations of the PCI ($r = .766$, $p < .01$), and AEQ subscales (see Table 3) reached the expected values and expected directions, which supported the creation of single constructs.

Table 3. Zero-order correlation for Individual Emotions Subscales.

Subscales (AEQ)	Enjoy	Hope	Pride	Shame	Anger	Anxiety	Boredom
Hope	.882**						
Pride	.805**	.759**					
Shame	.124**	.061	.152**				
Anger	-.287**	-.306**	-.131**	.608**			
Anxiety	.033	-.027	.125**	.807**	.786**		
Boredom	-.322**	-.316**	-.159**	.494**	.871**	.685**	
Hopeless	-.307**	-.336**	-.159**	.681**	.839**	.762**	.770**

Note: **= $p < .01$.

Prior to employing path analysis, the zero-order correlation of the final scales were calculated (see Table 4) to understand the relationships among the scales. As hypothesized by the tested theoretical Models A and B (see Figure 1 and 2), the data also seemed to support the structural model.

The analysis of Complex SEM models is divided into four steps: (1) Model A for positive emotions as a moderator of the influence of coping on motivation; (2) Model B for negative emotions as a moderator of the influence of coping on motivation; (3) Measurement invariance for Model A with positive emotions as a moderator; and (4) Measurement invariance for Model B with negative emotions as a moderator.

Table 4. Descriptive Statistics of the Scales Including Reliability and Zero-order Correlation.

Scales	N ^o	M (SD)	ω	α	95%IC		r		
					Lower	Upper	1	2	3
1. Coping strategies	21	2.656 (.458)	.924	.921	.914	.928	1		
2. Positive emotions	22	2.617 (.577)	.959	.954	.949	.958	.690**	1	
3. Negative emotions	53	2.208 (.510)	.969	.969	.966	.971	-.150**	-.191**	1
4. Academic motivation	8	4.451 (1.492)	.949	.949	.944	.953	.614**	.731**	-.287**

Notes: α = Cronbach's α ; N^o = Number of items; M = Mean; SD = Standard Deviation; 95%IC = 95% Confidence α interval; ** $p < .01$; r = Pearson's r; ω = McDonald's ω .

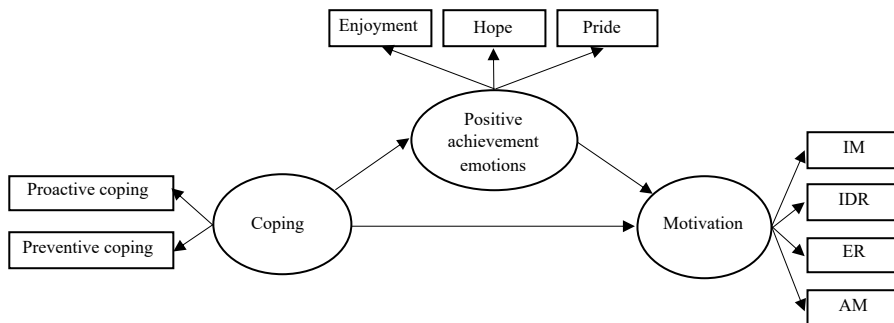


Figure 1. Path model connecting coping strategies, positive achievement emotions, and academic motivation.

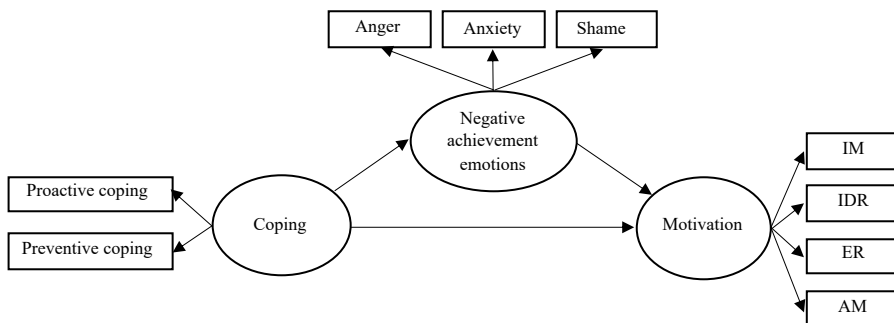


Figure 2. The path model connecting coping strategies, negative achievement emotions, and academic motivation.

As Models A and B are comparable in nature, the results of the path analysis can be also compared. These comparisons can answer many questions, the most important of which being these three: (i) is the role of positive and negative emotions comparable (i.e. whether we can compare the indirect impact of coping on motivation)?; (ii) is the explanatory power of positive and negative emotions comparable (i.e. whether we can compare the explained variance in both models)?; and (iii) is it necessary to include emotions as a moderator between coping and motivation (i.e. whether we can use models without emotions as a moderator)?

Unstandardized path coefficients, standard errors, and *t*-values for Model A can be seen in Table 5. As expected by the preliminary correlation analysis, coping strategies (Figure 3) were significantly and positively predictive of positive emotions (.75, $p < .001$). The path from positive emotions to academic motivation was also significant (.62, $p < .001$). Regarding effects of coping strategies on academic motivation, tested model also confirmed significant positive impact, however with a recognizably lower standardized regression weight of .21 ($p < .001$). Therefore, our interpretation of the directions of significant paths empirically confirmed that higher coping strategies were associated with higher levels of positive emotions and academic motivation in our sample of the Czech adult population.

Table 5. Fit Statistics for Model A.

Path	Estimate	Std. Est.	SE	<i>t</i>	<i>p</i>
Positive emotion to coping	.994	.753	.038	25.897	<.001
Motivation to positive emotion	1.610	.623	.096	16.729	<.001
Motivation to coping	.723	.212	.130	5.567	<.001
Preventive coping to coping	.915	.843	.030	30.676	<.001
Enjoyment to positive emotion	1.000	.958			
Hope to positive emotion	.982	.921	.018	55.660	<.001
Pride to positive emotion	.840	.835	.020	41.859	<.001
Intrinsic motivation to motivation	1.000	.963			
Identified regulation to motivation	.917	.928	.018	50.956	<.001
Proactive coping to coping	1.000	.908			

Notes: SE= Standard Error; Std. Est.= Standard Estimate.

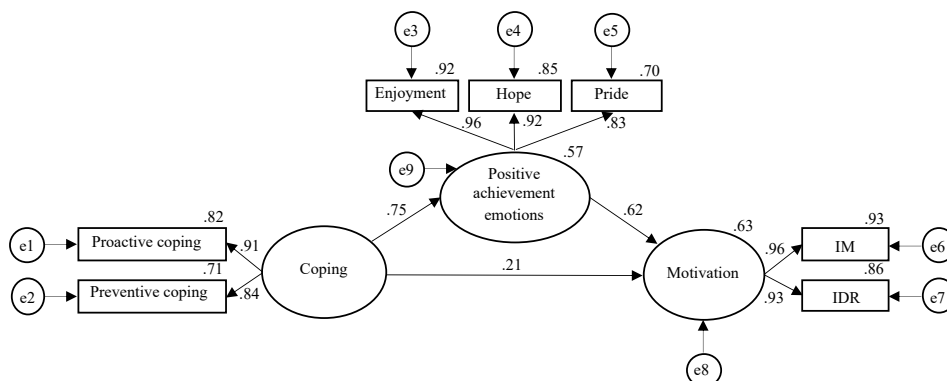


Figure 3. Model A with standardized coefficients; $\chi^2 = 46$ ($df = 11$); $CFI = 0.995$; $TLI = 0.990$; $RMSEA = 0.056$.
Source: IBM SPSS AMOS.

According to assessed model fit indices, Model A was appropriate (CFI and TLI above 0.95 and *RMSEA* below 0.08). As BIC for our model was slightly lower than BIC for the saturated model, we found even higher support for Model A, which fit the data very well. The explanatory power of the model was quite strong. R2 for motivation reached a value of .63, and for positive emotions .57 (see Figure 3). This means that standardized coefficients for relationships between coping and positive emotions, and positive emotions and motivation are nearly the same. As we were mainly interested in the role of positive emotions which served as moderator in Model A, we mainly evaluated the direct and indirect impact of coping on motivation.

A comparison of the direct and indirect effect of coping strategies on academic motivation (Table 6) offers very simple results, as the direct effect between coping and motivation is quite weak (.212, *p* <.001), and the indirect effect exerted through the mediator is quite strong (about two times higher, .469, *p* <.001). It seems reasonable to include positive emotions into Model A, as positive emotions serve as a good moderator connecting coping strategies and academic motivation.

Table 6. Direct, Indirect and Total Effects (Standardized) for the Path Model of Positive Emotions as Moderator (Model A).

Path	Direct effect	Indirect effect	Total
Coping–(Positive emotion)–Motivation	.753	.000	.753
Coping–Motivation	.212	.469	.681

The standardized coefficients of Model B are presented graphically (Figure 4), and the model fit statistics of unstandardized and standardized parameter estimates, standard errors, and *t*-values for Model B can be seen in Table 7

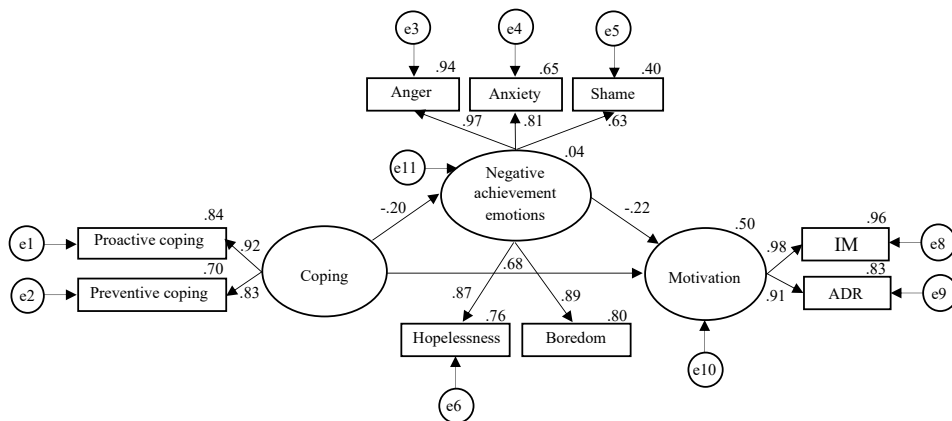


Figure 4. Model A with standardized coefficients; $\chi^2= 495$ (*df*= 23); *CFI*= 0.944; *TLI*= 0.913; *RMSEA*= 0.142. Source: IBM SPSS AMOS.

According to the model fit indices, Model B reached appropriate values of *CFI* and *TLI* (above 0.90), however, the value of *RMSEA* was higher than expected (0.142). Recommendations for *RMSEA* cut-off points that indicate good model fit are close to 0.060 (Hu & Bentler, 1999), or values below a stringent upper limit of 0.070 (Steiger, 2007). Moreover, BIC for the model was far from the values of the saturated model (0.648 vs. 0.312). On this basis, Model B was not fully empirically supported in the

Table 7. Fit Statistics for Model B.

Path	Estimate	Std. Est.	SE	t	p
Negative emotion to coping	-.272	-.203	.045	-6.043	<.001
Motivation to negative emotion	-.570	-.222	.064	-8.841	<.001
Motivation to coping	2.159	.628	.103	21.026	<.001
Preventive coping to coping	.896	.834	.033	26.844	<.001
Anger to negative emotion	1.000	.970			
Anxiety to negative emotion	.730	.808	.018	39.544	<.001
Shame to negative emotion	.537	.631	.022	24.731	<.001
Hopeless to negative emotion	.838	.872	.017	48.617	<.001
Boredom to negative emotion	.922	.893	.018	52.422	<.001
Intrinsic motivation to motivation	1.000	.980			
Identified regulation to motivation	.885	.912	.020	43.652	<.001
Proactive coping to coping	1.000	.918			

Notes: SE= Standard Error; Std. Est.= Standard Estimate.

sample of the Czech adult population. Furthermore, the explanatory power of Model B was very small, R^2 for motivation was reasonable (.50), but for negative emotions was only .04 (see Figure 2). This means that the standardized coefficient for relationship coping-emotions is very small.

A preliminary comparison of the results for Model A including positive emotions as a moderator, and Model B with negative emotions shows that Model A works well, although the model fit of the negative emotions is rather poor. This conclusion was supported by the evaluation of the direct and indirect effects of coping on motivation (Table 8). The direct effect was very strong (.628, $p < .001$), whereas the indirect effect was about four times lower (.155, $p < .001$). On this basis, it does not seem reasonable to include negative emotions into the model, as negative emotions do not serve as a good moderator. If we compare Model A and Model B, we can conclude that positive emotions work well as a moderator, while the performance of negative emotions as a moderator is very poor.

Table 8. Direct, Indirect and Total Effects (Standardized) for the Path Model of Negative Emotions as Moderator (Model B).

Path	Direct effect	Indirect effect	Total
Coping-(Negative emotion)-Motivation	-.203	.000	-.203
Coping-Motivation	.628	.155	.674

In this phase, we used Model A and generated a series of measurement invariance tests. The configural, measurement weights, and structural weights models were tested (see Table 8 and 9). For analytical reasons we applied two possible measurement invariances, by gender and age, dividing participants into three age categories of 18-34, 35-54, and 55+ years, respectively.

In line with Cheung and Rensvold (2002), we did not employ a chi-squared test for the differences among individual levels of invariance. Instead, the difference among values of CFI were used with difference lower than .01 considered as a good sign of invariance. The biggest difference was found between measurement weights and structural weights level (0.001). Thus, we can conclude that Model A is invariant according to gender with possibility to expect the same set of coefficients for male and female (see Table 9).

Further, Table 9 offers the invariance results for the comparison of Model A in terms of the three age categories. According to *CFI* comparison, the measurement weights model can be replaced by the configural model (*CFI* difference= 0.001). If we go further and evaluate invariance by structural weights, *CFI* difference reached the value of 0.002, which is still well above the recommended acceptable value (*TLI*= 0.989, *RMSEA*= 0.033), indicating the possibility to expect the same set of coefficients for different age categories and hence the possibility to compare Model A in terms of the different age of participants.

Table 9. Measurement Invariance of Model A by Gender and Age.

	Model	NPAR	CMIN	df	p	CFI
Gender	Configural	34	56.789	22	-	0.995
	Measurement weights	30	60.911	26	.390	0.995
	Structural weights	27	69.076	29	.092	0.994
Age	Configural	51	72.842	33	-	.995
	Measurement weights	43	81.955	41	.330	.994
	Structural weights	37	99.923	47	.019	.992

Note: *p*= *p* for comparison with conf. model.

DISCUSSION

The purpose of the study was to explore the interrelationships among coping strategies including proactive and preventive coping, positive and negative achievement emotions, and academic motivation. As hypothesized by the previous research, coping strategies were related to higher academic motivation (Gustems Carnicer, Calderón, & Calderón Garrido, 2019; Struthers, Perry, & Menec, 2000; Vizoso, Rodríguez, & Arias Gundín, 2018), and remained significant predictors of academic motivation even after controlling for the effect of positive emotions, i.e. enjoyment, hope, and pride. In fact, the indirect effect exerted through the mediator was stronger, about two times higher than was the direct effect between coping strategies and academic motivation. Therefore, we can assume that positive emotions such as enjoyment, hope, and pride within the tested Model A served as a good moderator connecting coping strategies and academic motivation. On the other hand, negative emotions as represented by anger, anxiety, shame, hopelessness, and boredom in the tested Model B did not work well as a moderator of the relationship between coping strategies and academic performance. In addition, Model A was invariant according to gender and age, indicating the possibility to expect the same set of coefficients for males and females and for the different age of participants.

The results of the study parallel findings of other studies that have confirmed coping strategies as a significant predictor of positive outcomes such as academic and personal/emotional adjustment (Leong, Bonz, & Zachar, 1997), or a predictor of achievement emotions and engagement (de la Fuente *et alia*, 2020; Greenglass & Fiksenbaum, 2009). Further, Fredrickson (2001) noted that the capacity to experience positive emotions represents a human strength which fosters motivation in various settings, including learning and performance. Consequently, studies have reported unfavorable functionality of negative emotions in adult learning and achievement, which appear to be frequently viewed as detrimental to academic motivation and performance (Rowe & Fitness, 2018), and can be largely effected by self-regulated learning (Mega, Ronconi, & De Beni, 2014) and critical thinking (Villavicencio, 2011). However, although proactive coping and emotions in learning are currently receiving well-deserved attention, the

presented structural models included in this study have not been fully tested to date, as neither model involved a representative sample of adult population. Therefore, our findings simply further extend the growing theoretical and empirical knowledge domain on positive psychology, including proactive coping literature which provides support for positive individual outcomes.

The presented study has also limitations that should be noted in a consideration of the presented findings. First, the cross-sectional nature and reliance on self-reported data rules out the possibility of exploring the development and changes of emotions and interpretations of their causal relations. Second, the coping strategies as measured by the selected subscales of the PCI (Greenglass *et alia*, 1999) included two similar, yet distinct guiding theoretical frameworks of proactive coping subscales which consider proactive coping as a method of assessing future goals and the striving of individuals toward successful achievements (Schwarzer & Taubert, 2002). These are labeled within the PCI as a proactive coping subscale, with a second definition describing proactive coping as a process that prepares individual for potential distinct stressors and possibly averts future stressors completely (Aspinwall & Taylor, 1997), labeled within the PCI as preventive coping subscale. In future research, it might be beneficial to compare results within these two future-oriented self-regulatory behaviors. Third, the results of the academic motivation was related to various ranges of the educational history that the participants had experienced in academic contexts. In future investigations it would be also interesting to explore the impact of specific situations that could influence the coping strategy respondents engaged in. Although it used a representative sample, the current study lacked cultural diversity, which may have influenced the generalizability of the presented findings. Therefore, it might be theoretically interesting to explore the relations among the researched variables across diverse cultural samples. Further, the generalization of the results may be limited by the sample characteristic, which involved the adult population. The adolescent population may show different characteristics, and the inclusion of specific clinical samples could bring more detailed results. On this basis, the utilization of sophisticated clinical applications like functional neuroimaging (e.g. D'Agata *et alia*, 2021; Phan, Wager, Taylor, & Liberzon, 2004) or real-time data collection (e.g. Kim & Hodges, 2012) might bring promising conclusions.

The results presented in this study deepen the potential that the inclusion of cognitive-behavioral and psychological constructs may have in dealing with study- or work-related burnout. Drawing on the published literature, Greenglass (2002) highlighted the positive effect of proactive coping on efficacy, job-related feelings of competence as well as proactivity. Thus, fostering the personal capability to manage stressful life events on a daily basis by employing coping strategies that would help to flourish positive emotions such as happiness would be beneficial. To support vitality and a positive mood, guard against lack of control and anxieties about the future, to overcome difficult obstacles of all kinds including work and study-related difficulties, or to foster an individual's ability to proactively face unpredicted negative circumstances, including a pandemic, is coming under increased study. As with general applications, the promotion of information processing styles of ambiguous and emotionally negative information might protect against attention or cognitive interpretation biases that are also common in non-clinical samples of emotional disorders (Mathew & MacLeod, 2005). Although biases reduction might not be fully achieved, the change of the character of the perceived information from threatening to challenging, can have a significant impact on emotional experience (Griva & Anagnostopoulos, 2010).

Conceptualizing coping strategies as a set of future-oriented competencies contributing to the promotion of psychological well-being, emotionality, proactivity and vitality which are attainable at any age allows the translation of this approach into targeted interventions. In this regard, the effectiveness of a brief educational program based on proactive coping theory in middle and late adulthood was shown to be effective highlighted the promising significance of both non-therapeutic (Bode, de Ridder, Kuijer, & Bensing, 2007) and therapeutic practice (Kroese *et alia*, 2014). Nevertheless, empowering positive development, cultivating hope and optimism, emotion regulation, and proactive resilience approaches have also had high importance in the early stages of life, including childhood and adolescence (i.e. Alvord & Grados, 2005; Gillham & Reivich, 2004; Margalit, 2010). Finally, it can be said that this new horizon of research on the mediating effects of achievement emotions in relationships in terms of coping strategies and academic motivation along with the potential efficacy of intervention-based frameworks promoting positive person functionality and development represent an valuable addition to current theory and practice.

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Received, July 11, 2021
Final Acceptance, July 25, 2021