

The sources of stress and coping styles as mediators and moderators of the relationship between personality traits and physical symptoms

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In order to better understand the relationship between stress and coping, it is important to understand and explain how and why, as well as when, and under what conditions the effects of various antecedent variables exert their effects on adaptational outcomes. Therefore, the aim of the present study was to examine the mediating and moderating effects of various sources of stressful events and coping styles between dimensions of the five-factor model of personality and perceived frequency of physical symptoms. These problems were examined in a representative sample of 948 students from the fifth to the eighth grade of elementary school.

The results of hierarchical regression analyses show that stressful events connected to relationships with teachers and parents/family significantly moderate the effects of neuroticism on physical symptoms. The frequency of physical symptoms increases more as a function of stress intensity connected to relationships with teachers in adolescents high in neuroticism than in emotionally stable adolescents, while an increase in stress intensity connected to relationships with parents/family increases the frequency of physical symptoms more in emotionally stable adolescents. When considering coping styles, only problem-focused coping moderates the effect of neuroticism on physical symptoms, so that in emotionally stable individuals an increase in problem-focused coping is related to a decrease in physical symptoms, while in individuals high in neuroticism it is related to an increase of the frequency of physical symptoms.

The results of two path analyses show that stressful events partly mediate the effects of neuroticism, conscientiousness, extraversion and openness/intellect on the frequency of physical symptoms. Regarding coping styles, emotion-focused coping partly mediates the effect of extraversion, and avoidance coping the effect of neuroticism on physical symptoms.

Key words: sources of stress, coping styles, personality traits, physical symptoms

Numerous studies examine the role of personality and its interaction with situational demands to the perceived stress (Ben-Porath & Tellegen, 1990; Watson, 1990), ways of coping with stress (Costa, Somerfield, & McCrae, 1996; Watson & Hubbard, 1996) and subjective physical health (Bolger & Schilling, 1991; Endler & Parker, 1990). The effects of personal dispositions are emphasized especially in ambiguous and threatening situations (Caspi & Moffitt, 1993). Because personality traits have effects on intrapersonal as well as interpersonal resources, and through them, on the ways of coping with stress, a relationship between personality traits, perceived stress and coping could be expected.

Research on the relationships between personality traits and coping with stressful situations most often examine Eysenck's personality traits, especially neuroticism and extraversion (Bolger, 1990), while other dimensions of the five-factor model of personality are examined somewhat less frequently (Costa et al., 1996). Generally, results show significant associations between neuroticism and exposure to stressful events, perceived stress, coping and health outcomes (Watson & Hubbard, 1996). Neuroticism predicts the frequency of various stressful life events when operationalized both objectively as well as subjectively (Bolger & Schilling, 1991; Gunthert, Cohen, & Armeli, 1999).

Many studies have shown that individuals high in neuroticism have a tendency to negatively evaluate events around them, interpret ambiguous stimuli as negative and threatening (Penley & Tomaka, 2002), are easily upset, overreact to daily hassles (Watson, Clark, & Harkness, 1994) and remember negative events better than emotionally stable individuals (Bolger & Schilling, 1991). Also, research has shown that neuroticism is negatively related to the use of

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some effective coping strategies such as problem-focused and active coping (Costa et al., 1996), and positively associated with avoidance coping (O'Brien & DeLongis, 1996; Watson & Hubbard, 1996) as well as other immature coping strategies (e.g. escapist thinking, hostile reactions, self-blame, withdrawal) (Bolger, 1990). Additionally, individuals high in neuroticism rely more on emotion-focused coping in comparison to individuals low on this dimension (Penley & Tomaka, 2002). Neuroticism is also highly related to many other coping outcomes, such as physical symptoms and general negative affect (Bolger & Schilling, 1991).

Extraversion is usually positively connected with active, social and optimistic appraisal of stressful situations (Gallagher, 1990) and higher perception of control (Penley & Tomaka, 2002). The majority of research on adults and adolescents show that it is positively related to problem-focused coping strategies like rational action, positive thinking, restraint coping and with emotion-focused coping (Kardum & Krapić, 2001; Watson & Hubbard, 1996).

Agreeableness, described as the tendency to be forgiving, kind, generous, trusting, sympathetic, compliant, altruistic, and trustworthy (McCrae & John, 1992) is positively associated with the emotion-focused coping strategies of social support seeking, active coping, planning, confrontative coping and positive reappraisal, and negatively associated with self-blame, avoidance and wishful thinking (Penley & Tomaka, 2002; Watson & Hubbard, 1996).

Conscientiousness refers to the tendency to be organized, efficient, reliable, self-disciplined, achievement-oriented, rational, and deliberate (McCrae & John, 1992) and is significantly positively associated with problem-focused coping and its various components like active coping, planning, restraint coping and acceptance of responsibility. On the other hand, it has been found that individuals high in conscientiousness use less emotion-focused coping and different forms of avoidance coping such as alcohol and drug abuse, as well as mental and behavioural disengagement (Penley & Tomaka, 2002).

Individuals high on openness to experience tend to be more curious, artistic, insightful, intellectual, original, have more differentiated emotions, wider interests, nonconventional values and preference for diversity (McCrae & John, 1992). As such, it could be hypothesized that they may have more opportunities to develop more creative coping strategies (Watson & Hubbard, 1996). However, the relationship between openness and coping is not always conclusive. Namely, some research findings show positive relationships between openness and active, affirmative coping and positive reinterpretation, and low positive correlations with humour use and negative with avoidance coping (Penley & Tomaka, 2002). Yet other studies have not found any significant relationship between this personality dimension and coping with stress (e.g. Hooker, Frazier & Monahan, 1994). However, Penley and Tomaka (2002) found that openness

was positively correlated with perceived responsibility for and control over a task. Additionally, research has shown that agreeableness, conscientiousness, extraversion and openness are positively related to the perception of good health (e.g. Friedman et al., 1995).

The relationship between variables involved in the process of stress could be examined by three different theoretical and statistical models. The first is the model of direct effects on health outcomes, the second predicts that the effects of some variables on health could be mediated by other variables, while the third one states that some variables could moderate (increase or decrease) the effects of some other variables on health outcomes (Aldwin, 1994; Baron & Kenny, 1986). Mediating variables explain how and why a certain effects occur while moderators specify when and under what conditions the effects of independent variable will be exerted (Baron & Kenny, 1986; Holmbeck, 1997).

The direct effects of coping strategies on health outcomes are examined most often. The results suggest that problem-focused and instrumental coping strategies are negatively related to the number and intensity of the perceived physical symptoms (Eriksen, Olff, & Ursin, 1997). Reappraisal as a form of emotional regulation also has a more positive impact on physical health than emotional suppression and task oriented emotional regulation (Gross, 1998). Social support seeking is related with decreased lower back pain intensity (Turner, Clancy, & Vitaliano, 1987), while aggressive coping with a greater number of perceived physical symptoms (Rauste-von Wright & von Wright, 1991). Avoidance coping is most often related to more physical symptoms (e.g. Pisarski, Bohle, & Callan, 1998), and illnesses (Nowack, 1991), and prolonged use of this type of coping may lead to the development of various delayed negative health outcomes (Aspinwall & Taylor, 1992; Carver et al., 1993).

Research has also shown that coping could mediate the effects of personality traits on self-assessed physical symptoms, which means that the relationship between predictor (e.g. personality traits) and outcome variables (e.g. physical symptoms) could be to some degree explained by coping strategies (Bermudez, 1999; Fry, 1995). Along with direct and mediating effects, coping has also moderating effects on physical symptoms (Eriksen & Ursin, 1999). It should be noted that in some studies in which the effects of personality traits such as neuroticism (McCrae, 1990) and anxiety (Hemenover & Dienstbier, 1998) have been controlled for, the relationship between coping and general self-appraised health ceased to be significant.

It is well known that during puberty and early adolescence more complex cognitive skills begin to develop, which are related to the more frequent use of problem-focused coping (Weisz, 1986) and an increasing repertoire of problem-solving skills as well as greater coping resources (e.g. Knapp, Stark, Kurkjian, & Spirito, 1991). Aspects of cognitive development, including greater skills in making

inferences about internal states, learning through observation of others, increased awareness of different coping strategies result from developmental advances in problem-solving abilities, increased cognitive complexity and maturity, greater empathy and perspective taking abilities, greater metacognitive awareness and increasing regulation of emotions, situations, and emotion-driven behaviours (Eisenberg, Fabes, & Guthrie, 1997).

Although some coping strategies in adolescent development relatively fast, ineffective coping mechanisms are also abandoned during this period. For example, research shows that younger adolescents use more wishful thinking and distancing than older adolescents (Frydenberg & Lewis, 1991), and that between the thirteenth and fifteenth year there is a significant general decrease in the use of avoidance coping (Rauste-von Wright, 1987). However, adolescence can also be a critical period for the development of maladaptive ways of coping with stress, as strategies like social withdrawal, alcohol and drug abuse are learned for the first time (Aldwin, 1994; Kalebić, Krapić, & Lončarić, 2001). This period of development is widely recognized as particularly stressful because it is characterized by change, loss and disruption of the prior structure of one's life.

Compas, Wagner, Slavin and Vannatta (1986) have emphasized life transitions as particular periods of vulnerability to stressful events. Adolescents undergo many changes in various domains on a daily basis, which can make their adjustment more difficult. During this period they simultaneously have to deal with physical and cognitive changes, the challenges of changing family and peer relationships, school transitions and accompanying changes in peer groups, social complexity, educational demands and expectations, as well as decisions about schooling and careers (Boekaerts, 1996; Frydenberg & Lewis, 1993). Stressing regards to stress, it seems that early adolescence may be an especially vulnerable and stressful period, in part because of multiple transitions that cause stress occur simultaneously (Seiffge-Krenke, 1993). Stressful events in adolescence have been found to be related to a wide range of problems, including depression and anxiety (Leadbeater, Blatt, & Quinlan, 1995), delinquent behaviour (Vaux & Ruggiero, 1983), suicide attempts (Adams, Overholser, & Spirito, 1994) and somatic health (Greene, Walker, Hickson, & Thompson, 1985).

Two types of stressors that appear to affect coping process are major life events and daily hassles. Daily hassles are more proximal, focusing on the day-to-day disruptions in one's life, occurring with greater frequency than major events, while major life events are critical or traumatic events that are often non-normative in nature. For adolescents, major life events may involve a parental divorce, death of a loved one, changing schools, and so forth. Although they occur less often than daily hassles they are rated more negatively and appraised as more challenging, threatening and undesirable in early as well as in later adolescence (Davis & Compas, 1986). This is probably one of the reasons why

most of the research on stress and coping focuses on major life events (Williams & McGillicuddy-De Lisi, 2000). However, it has been asserted that daily stressors also have enduring effects and magnify the difficulty of coping with major life events as well (Sandler, Wolchik, MacKinnon, Ayers, & Roosa, 1997). Also, research on adults has shown that the daily hassles correlate with physical and psychological dysfunction equally or even higher than the major life events (e.g. Compas, 1987). It is conceivable that the reliance on only one class of events (major life events) reduces the probability of obtaining significant relationships between stressful life events and outcome variables. Therefore, this study chose to examine stress in adolescents as measured by the level of daily hassles.

Additionally, research addressing the role of situational factors in the stress and coping process has employed a number of different categories of stressful situations. For example, in a sample of seventh- and eighth-graders Wills (1986) employed five common problems - school, parents, health, feeling sad and problems with friends. Stark, Spirito, Williams and Guevremont (1989) found that adolescents most commonly reported experiencing problems with school, parents, friends and boy/girlfriends, while Pillow, Barrero and Chassin (1998) found four clusters of problems that were labeled family-related conflict, general child relationship problems, parent problems and major illness/bereavement. In some studies, school-related pressures and expectations were the most frequently cited and the most intense daily stressors mentioned by adolescents (de Anda et al., 2000; Halstead, Johnson, & Cunningham, 1993). Based on the most commonly reported stressful situations, the present study divided into stressors into four categories including parents/family, teachers, friends/peers and achievement.

Because mediating and moderating models of psychological processes allow interesting associations to be decomposed into components that reveal possible causal mechanisms, these models are useful for theory development and testing as well as for the identification of possible points of intervention. Therefore, the aim of this study was to examine how coping styles and various sources of stress in the period of early adolescence mediate and moderate the effects of personality traits on the frequency of perceived physical symptoms.

On the basis of the previous research results, clear hypotheses could be stated only for the dimension of neuroticism, which is expected to directly and indirectly increase the frequency of physical symptoms. For the other dimensions of the five-factor model inverse, but much weaker, effects on physical symptoms could be expected. It could be also expected that all four sources of stressful events, as well as avoidance coping, will exert effects on physical symptoms independently, and that coping styles and various sources of stress will mediate and moderate the effects of personality traits, especially neuroticism, on physical symptoms.

METHOD

Participants and procedure

A sample of 948 students from the fifth to eighth grade from elementary schools in one Croatian county (Županija primorsko-goranska) participated in this study. The sample was representative according to the sex and age of the children. There were 469 females and 479 males, ranging from 11 to 16 years of age ($M = 13.31$; $SD = 1.22$). The data were collected through a questionnaire administered collectively during an hour of class time (45 minutes). The experimenters were students of psychology especially instructed for this purpose. Because this study is only a part of a greater project additional instruments were also used. Complete anonymity was guaranteed to the participants.

Measures

Big five personality dimensions were measured by an instrument constructed from adjectives describing various personality traits in the Croatian language (Kardum & Smojver, 1993). Twenty five adjectives (5 for each dimension) were chosen for the purpose of the present study. All dimensions of the five-factor model were covered and could be easily understood by elementary school children. With each adjective, a 5 point Likert scale was used (1 – I am never like that, 5 – I am always like that). Because this instrument was used for the first time on the sample of schoolchildren, its structure was tested by a confirmatory factor analysis. Indices obtained gave satisfactory proof of the predicted five-factor structure. The overall proportion of the explained variance ($CFI = 0.96$; $GFI = 0.97$; $AGFI = 0.95$), as well as those of residual variability and the differences between the observed and model-implied covariances ($RMSEA = 0.028$; $RMR = 0.034$) are acceptable. Chi-square was statistically significant (418.24 ; $df = 241$; $p < .001$), as expected, because of the large sample size. Because Chi-square is very sensitive to the sample size, it is suggested that its value should be divided by the degrees of freedom, and that values that are less than three indicate the adequacy of the model tested (Kline, 1998). In this study, the ratio between the value of Chi-square and degrees of freedom is 1.74. Loading of items on the predicted factors ranged from .33 to .70, with secondary loadings from -.14 to .44. All items were most highly loaded on the predicted factor. Openness/intellect was the best confirmed, and only those items which were predicted were loaded on this factor. Neuroticism had the most secondary loadings. Except predicted items, significant loadings on neuroticism had also two items which measured extraversion, one that measured agreeableness and one conscientiousness.

The internal reliability coefficients (Cronbach-alpha) obtained on the sample of this study are .61 for extraversion,

.60 for agreeableness, .68 for conscientiousness, .65 for neuroticism and .63 for openness/intellect. Neuroticism had a zero correlation with the other four personality dimensions, and correlations between them ranged from .39 ($p < .001$; extraversion and conscientiousness) to .52 ($p < .001$; agreeableness and conscientiousness). Neuroticism (.07; $p < .05$) and openness/intellect (-.10; $p < .01$) were significantly, but lowly, correlated with the age of participants. Gender differences were obtained on the dimensions of extraversion ($t(946) = 2.22$; $p < .05$), agreeableness ($t(946) = 7.81$; $p < .001$), conscientiousness ($t(946) = 5.33$; $p < .001$) and neuroticism ($t(946) = 2.40$; $p < .05$), with girls having higher scores.

Coping styles were measured by short version of the Coping Inventory for Adolescents (Kardum & Krapić, 2001). This questionnaire consists of 18 items, with answers on a 5-point Likert scale (1 – I usually don't do that at all, 5 – I do that almost always). This inventory measures three coping factors: problem-focused coping (6 items, e.g. I try to solve the problem as hard as I can), emotion-focused coping (6 items, e.g. I try to share feelings related to the problem with the persons that are close to me) and avoidance coping (6 items, e.g. I act as if nothing happened.). The internal reliability coefficients (Cronbach alpha) for this sample were .82 for problem-focused coping, .85 for emotion-focused coping and .66 for avoidance coping. Correlations between these coping styles were from .15 ($p < .001$; emotion-focused coping and avoidance coping) to .48 ($p < .001$; problem and emotion-focused coping). None of the coping styles was significantly related to the age of participants, and gender differences were obtained only for emotion-focused coping, with the higher scores obtained on the subsample of girls ($t(946) = 4.76$; $p < .001$).

The perceived frequency of daily stressful events was measured by Stressful Events Scale for Adolescents (33 items), which was constructed on the basis of the most frequent stressors for school children. This scale measures four groups of stressful events: those connected to the relationships with parents and family (e.g., Parents forbid my relations with some of my friends); connected to the relationships with teachers (e.g. I feel teachers do not care about me or other students), connected to the relationships with friends/peers (e.g. Conflicts and arguments with other students in the classroom) and stressful events connected to achievement (e.g. Fear that because of bad marks I will not be able to enter the school of my choice). The frequency of each stressful event was assessed on a 5 point Likert scale (1 – It almost never happens to me, 5 – It happens to me very often). The internal reliability coefficient (Cronbach alpha) of these four scales ranged from .74 to .82, and the correlations between them varied from .10 ($p < .01$) to .52 ($p < .001$). Girls and boys significantly differed regarding to the frequency of the stressful events connected to parents/family ($t(946) = 3.02$; $p < .01$), friends/peers ($t(946) = 2.90$; $p < .01$) and achievement ($t(946) = 2.27$; $p < .05$), with all three groups

of stressful events more frequently mentioned by boys. The frequency of stressful events connected to teachers (.26; $p < .001$), friends/peers (-.08; $p < .01$) and achievement (-.07; $p < .05$) was significantly correlated with the age of the participants.

Physical symptoms were measured by a short form of the Pennebaker Inventory of Limbic Languidness (PILL) (Pennebaker, 1982). Thirteen items measuring the symptoms of autonomic dysfunction (e.g. racing heart) and gastrointestinal problems (e.g. abdominal pain, upset stomach) were used in the present study with answers on 5-point Likert scale (1 – I never feel like that, 5 – I almost always feel like that). The internal reliability coefficient (Cronbach alpha) for this scale was .84. The frequency of physical symptoms was not significantly correlated with the age of participants, however, these symptoms were more frequently reported in the subsample of girls ($t(946) = 3.32$; $p < .01$).

RESULTS

Relationships between variables

Correlations between personality traits, coping styles, different stressful events and physical symptoms were computed. The correlations obtained are presented in Table 1.

As can be seen from the Table 1 extraversion, agreeableness, conscientiousness and openness/intellect were positively correlated with problem and emotion-focused coping, while neuroticism was positively, and conscientiousness negatively related with avoidance coping. As expected, neuroticism was most highly correlated with the various sources of stressful events. The lowest correlation with various sources of stressful events was obtained for the dimension of openness/ intellect. From the four sources of stressful events, those connected to the relationships with parents/

family were the most highly related to personality traits, while sources connected to the relationships with teachers and friends/peers were related somewhat more lowly, with the lowest correlation was to the sources connected to achievement. All sources of stressful events were significantly positively related to physical symptoms. Physical symptoms were the most highly related to the personality trait of neuroticism and the avoidance coping style.

Moderator effects

To test the contribution of the interaction between personality \times coping and personality \times sources of stress to the prediction of physical symptoms, hierarchical regression analyses were used. In the first group of regression analyses, the interaction effects between personality \times coping styles were analyzed. The five-factor personality traits were included as independent variables in the first step, coping styles in the second, and interaction terms between personality traits and coping styles in the third. In order to avoid a problem with multi-colinearity because of too many predictors in the third step of the analysis, separate analyses for each personality trait and its interaction with coping styles were performed. In the second set of the analyses, the interaction effects of personality \times sources of stress were analyzed in the same way as in the first set of analyses.

When personality traits \times coping styles interactions were examined, the results showed that in the third step of the analyses, coping styles significantly predicted physical symptoms only in the interaction with neuroticism. The results of hierarchical regression analysis with neuroticism \times coping styles interactions are presented in Table 2.

Along with the expected positive main effect of neuroticism on the frequency of physical symptoms, small but significant negative effects of conscientiousness and extraversion were also obtained. Coping styles as a group of vari-

Table 1

Correlations between, personality traits, coping styles, perceived stressful events and physical symptoms ($N = 794$)

	E	A	C	N	O/I	Physical symptoms
Problem-focused coping	.23***	.27***	.32***	.01	.24***	-.04
Emotion-focused coping	.32***	.23***	.23***	.05	.21***	.08*
Avoidance coping	.002	-.01	-.11**	.18***	.000	.20***
Parents/ family	-.22***	-.20***	-.26***	.28***	-.07*	.33***
Teachers	-.07*	-.15***	-.26***	.35***	-.05	.41***
Friends/peers	-.24***	-.10**	-.16***	.25***	-.05	.38***
Achievement	.11**	.01	-.03	.18***	.11**	.19***
Physical symptoms	-.08*	-.02	-.12***	.38***	-.04	

Note. E – extraversion, A – agreeableness, C – conscientiousness, N – neuroticism, O/I – openness/intellect.

*** $p < .001$. ** $p < .01$. * $p < .05$.

Table 2
The results of hierarchical regression analysis with neuroticism × coping styles interactions

Predictors	Physical symptoms					
	R	R ²	F- change	overall F	df	β
PERSONALITY TRAITS						
Neuroticism	.39	.16		30.31***	5,827	.36***
Conscientiousness						-.10*
Extraversion						-.08*
COPING STYLES						
Emotion-focused coping	.43	.18	9.22***	22.97***	3,824	.12***
Avoidance coping						.11***
NEUROTICISM × COPING						
Neuroticism x Problem-focused coping	.44	.19	3.49*	17.81***	3,821	.10**

Note. Only significant predictors are shown.
p* < .05. *p* < .01. ****p* < .001.

Table 3
The results of hierarchical regression analysis with neuroticism × sources of stress interactions

Predictors	Physical symptoms					
	R	R ²	F- change	overall F	df	β
PERSONALITY TRAITS						
Neuroticism	.43	.18		34.37***	5,782	.25***
Agreeableness						.09*
SOURCES OF STRESS						
Teachers	.54	.30	32.27***	36.49***	4,778	.19***
Friends/peers						.20***
Parents/family						.10**
NEUROTICISM × SOURCES OF STRESS						
Neuroticism × teachers	.55	.31	2.58*	26.26***	4,774	.11**
Neuroticism × parents/family						-.09*

Note. Only significant predictors are shown.
p* < .05. *p* < .01. ****p* < .001.

ables significantly increased the coefficient of multiple correlation, even after controlling for the effect of personality traits on the frequency of physical symptoms. Emotion-focused coping and avoidance coping significantly positively predicted physical symptoms. Interaction terms between neuroticism and coping styles as a group of variables also significantly increase the coefficient of multiple correlation after controlling for the main effects of personality traits and coping styles. Regarding the individual interactions a small, although significant, effect of neuroticism x problem-focused coping on the frequency of physical symptoms was obtained. This shows that in emotionally stable individuals, an increase in problem-focused coping is related to a decrease in the frequency of symptoms, while in individuals high in neuroticism an increase in problem-focused coping is related to an increase in the frequency of physical symptoms.

When personality traits x sources of stress interactions were analysed, the results showed that in the third step of

the analyses, sources of stress significantly predict physical symptoms also only in the interactions with neuroticism. Therefore, the results of hierarchical regression analysis with neuroticism × sources of stress interactions are presented in Table 3.

The results obtained showed that after the effects of personality traits on physical symptoms were controlled, various sources of stressful events as a group of variables significantly increase the coefficient of multiple correlation. All sources of stressful events, except those related to achievement, were significant positive predictors of the frequency of physical symptoms. After controlling for the main effects of personality traits and sources of stressful events, interaction terms between neuroticism and sources of stressful events as a group of variables also significantly increase the coefficient of multiple correlation. Interactions between neuroticism and stressful events connected to relationships with teachers, as well as with parents/family were somewhat low, but significant, predictors of physical symptoms.

The frequency of physical symptoms increases more as a function of stress intensity connected to the relationships with teachers in participants with higher neuroticism. However, an increase in stress connected to relationships with parents/family appears to increase the frequency of physical symptoms more in emotionally stable individuals.

Mediating effects

The mediating effects of three coping styles and four sources of stressful events between five personality traits and the frequency of perceived physical symptoms were examined by two path analyses. In the first analysis the mediating effects of coping styles were examined, and in the second, the mediating effects of various sources of stressful events. In both analyses, the direct effects of personality traits and coping styles, or various sources of stressful events on physical symptoms, as well as the indirect (mediation) effects of personality traits, through coping styles or different sources of stressful life events were predicted. Because of the space limits, only Figure 1, showing the direct and indirect effects of personality traits and coping styles on physical symptoms is shown.

A Chi-square test for goodness-of-fit shows that the model fits the data ($\chi^2 (8, N=948) = 4.97; p = .76$). Neuroticism exerts direct positive (.36) effects and conscientiousness exerts (-.10) direct negative effects on physical symptoms. Personality traits also have a significant direct effect on coping styles. Extraversion has a positive effect on emotion-focused coping (.21); agreeableness (.12) and conscientiousness (.21) on problem-focused coping; while neuroticism has a positive effect (.18), and conscientiousness a negative (-.20) effect on avoidance coping. Furthermore, significant overall effects of emotion-focused (.10) and avoidance coping (.11) on physical symptoms were also obtained. Additional analyses of the overall effects show that they contain small, but significant, indirect effects of neuroticism, extraversion and agreeableness on the frequency of physical symptoms. In other words, emotion-focused coping partly mediates the effects of extraversion and agreeableness, while avoidance coping mediates the effects of neuroticism on physical symptoms. Neuroticism directly and indirectly increases the frequency of physical symptoms, while extraversion and conscientiousness also increase the frequency of physical symptoms, but indirectly through emotion-focused coping.

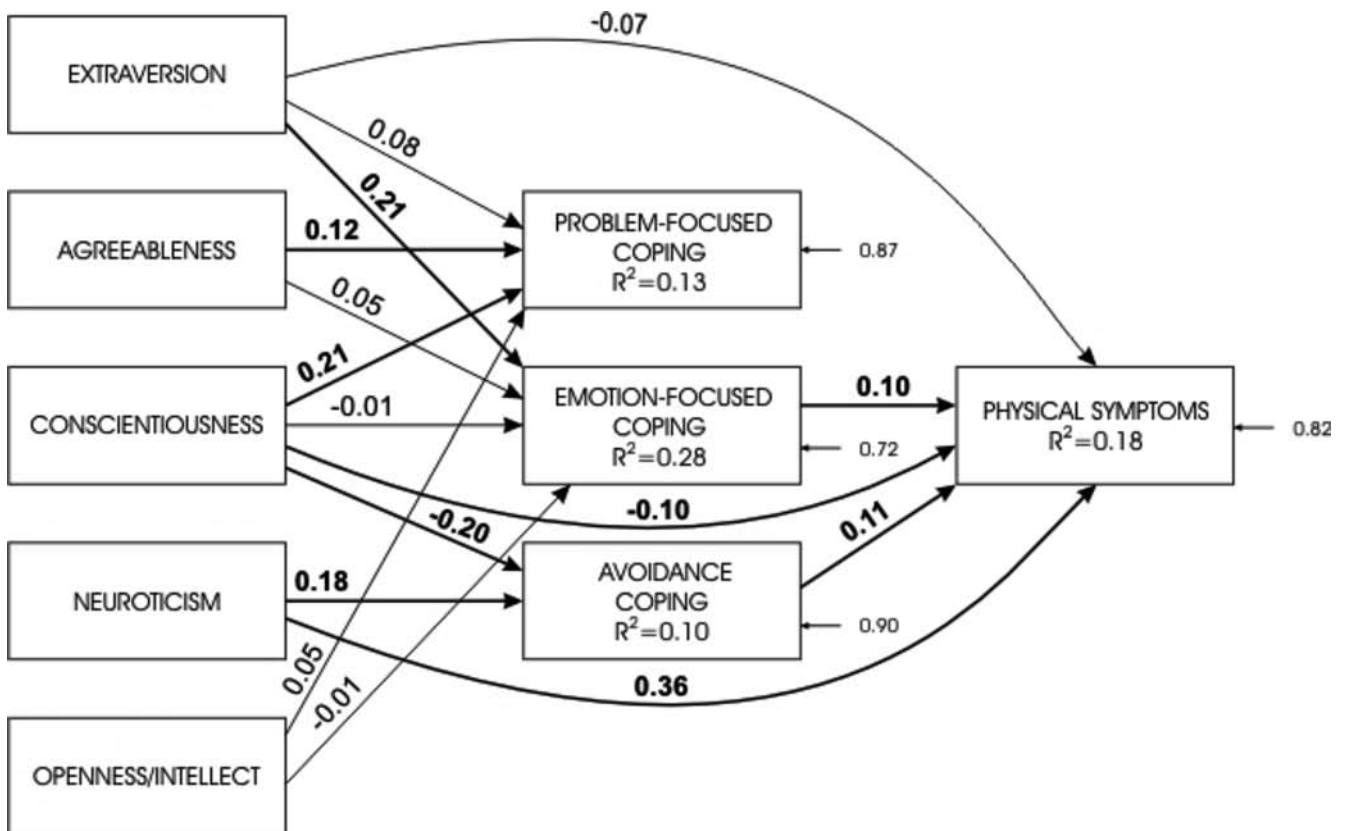


Figure 1. Path coefficients showing direct and indirect effects of personality traits and coping styles on physical symptoms

When various sources of stressful events are analysed as mediating variables, a chi-square test for goodness-of-fit also shows that the model fits the data ($\chi^2(6, N=948) = 8.83; p = .18$). The variances explained in mediating variables are 17% for parents, 34% for teachers, 23% for friends/peers and 14% for achievement, and 28% for physical symptoms.

Neuroticism exerts significant direct effect on physical symptoms (.24). Furthermore, neuroticism has significant positive effects on stressful events connected to relationships with parents/family (.27), teachers (.24) and friends/peers (.12). Extraversion has significant positive effects on stressful events connected to relationships with teachers (.09) and achievement (.13), and negative effects on stressful events connected to relationships with parents/family (-.17) and friends/peers (-.18). Conscientiousness has negative effects on stressful events connected to relationships with parents/family (-.21) and teachers (-.18), while openness/intellect has positive (.13) effects on stressful events connected to relationships with parents/family. From the total effects of various sources of stressful events on physical symptoms, those related to the stressful events connected to relationships with parents/family (.21), teachers (.24) and friends/peers (.22) are significant. Analyses of the total effects show that they included significant indirect effects of neuroticism, extraversion, conscientiousness and openness/intellect on physical symptoms. Namely, stressful events, especially those connected to relationships with parents/family and teachers partly mediate the positive effects of neuroticism and negative effects of conscientiousness on the frequency of physical symptoms. Stressful events connected to relationships with parents/family and friends/peers mediate negative effects of extraversion, while stressful events connected to relationships with parents/family partly mediate the positive effects of openness/intellect on the frequency of physical symptoms.

DISCUSSION

As expected, the results of this study show that when considering personality traits, neuroticism exerts the strongest effect on physical symptoms, increasing their frequency, while the effects of conscientiousness and extraversion are weaker and opposite that of neuroticism (Tables 1 and 2). Furthermore, regarding coping styles, emotion-focused and avoidance coping strategies directly increase physical symptoms (Tables 1 and 2). All sources of stressful events, with the exception of achievement, directly increase the frequency of physical symptoms (Table 3).

Considering the moderating effects of coping styles, the results show that problem-focused coping moderates the effect of neuroticism (Table 2). Namely, in emotionally stable individuals an increase of problem-focused coping is related to a decrease in the frequency of physical symptoms,

while in individuals high in neuroticism, problem focused coping results in an increase of the frequency of physical symptoms. An analysis of the mediating effects of coping styles (Figure 1) shows that emotion-focused coping partly mediates the effect of extraversion, and avoidance coping mediates the effect of neuroticism on physical symptoms. In their differential choice-effectiveness model, Bolger and Zuckerman (1995) propose that emotional reactivity of high N person can be explained by differences in both coping choice and coping effectiveness. Coping choice refers to the coping mechanisms that individuals use in response to stress and coping effectiveness to the degree to which the coping strategies are effective in reducing distress. Thus, there is a possibility that high-N individuals are more emotionally reactive because they choose less adaptive coping strategies (coping choice), or that they choose similar strategies to those chosen by low-N individuals, but that they are ineffective at alleviating their distress (coping effectiveness). The results obtained show that both these processes are possible in adolescents high in neuroticism. Namely, on the one hand, individuals high in neuroticism use nonadaptive coping strategies more often (avoidance coping), while on the other hand, even if they use strategies characteristic of low-N individuals (problem-focused coping), they are ineffective for them, and lead to an increase in physical symptoms.

The analysis of moderating effects of various sources of stressful events (Table 3) shows that stressful events connected to relationships with teachers and parents/family moderate the effects of neuroticism on physical symptoms. Along with the higher stress connected to relationships with teachers, the frequency of physical symptoms increases more in high-N individuals; while along with the higher stress connected to relationships with parents/family, the frequency of physical symptoms increases more in emotionally stable children. Additionally, all sources of stress, except those connected to achievement, mediate the effects of neuroticism, extraversion, conscientiousness and openness/intellect on physical symptoms. More specifically, stressful relationships with parents/family and teachers mediate the increasing effects of neuroticism and the decreasing effects of conscientiousness on the frequency of physical symptoms. Stressful relationships with parents/family and friends/peers mediate the decreasing effects of extraversion, while parents/family relationships mediate the increasing effects of openness/intellect on the frequency of physical symptoms.

The results of the previous studies show that in early adolescence conflicts with parents tend to increase and family relationships become perturbed problematic (Seiffge-Krenke, 1999). It is not until late adolescence that parent-adolescent relationships become less conflictual and more balanced. In addition, in early to mid-adolescence, school-related problems may arise because of a decrease in achievement and/or a decrease in motivation. Bad grades are a frequent

age-specific stressor during this time, and it is not until late adolescence that grades improve (Seiffge-Krenke, 1998). It is interesting that the moderating and mediating effects in this study are exerted by those sources of stress that are, to a greater extent, connected to social relationships (parents/family, teachers, friends/peers). Previous studies have used various categories of stressful situations, which significantly complicate the interpretation of the results obtained. Recently, the metaconstructs of agency and communion (Wiggins & Trapnell, 1996) have been extended to characterize basic dimensions of situations. Agentic situations have been characterized as involving demands that are related to strivings for mastery, power, achievement, work performance and instrumental task completion. In contrast, communal situations have been characterized as involving demands that are related to strivings for love, intimacy, friendship, affiliations, emotional relatedness, belongingness, mutuality, group cohesion, communality and relationship maintenance. As demonstrated by research on adults (e.g. O'Brien & DeLongis, 1996) these dimensions may have particular heuristic value for stress and coping research. The results of the present study indicate that this taxonomy of stressful events could be appropriate to an adolescent population. Namely, the results of the present study show that personality traits influence the frequency of physical symptoms primarily in communal situations. These results once again confirm the importance of interpersonally stressful situations, since problems in social relationships can have serious implications for well-being (Hammen, 1992). Until now, there have been only a few studies examining the relationship between personality traits and specific types of daily stressors. Results from these studies show that neuroticism is associated with higher rates of undesirable family and friend stressors as well as undesirable leisure stressors (David et al., 1997), and that high-neuroticism individuals are prone to experience interpersonal stress. This propensity might be because people react negatively to the chronic negative affectivity of the high-N individual.

In summary, the results of this study suggest that personality traits, even in early adolescence, could be important determinants of psychological outcomes. It is not quite clear how they lead to these outcomes, but it is obvious that stressful experiences and how children cope with them play an important explanatory role. Additionally, it seems that even in early adolescence exposure-reactivity models best represent the effects of personality dispositions on health and psychological outcomes. Although some of the obtained effects of coping styles, especially interaction terms of personality and coping styles, as well as personality and sources of stress, explain a relatively small amount of variance in the criterion variable, they could nevertheless be important in suggesting which processes should be further examined in more detail. Also, when the amount of the explained variance of the criterion variable is being evaluated, the limitations and interpretive ambiguities related to the coefficient

of determination should be kept in mind (e.g. Ozer, 1985; Rosenthal, 1990; Steptoe & Wardle, 2001).

In order to better understand the individual-differences factors that can influence the stress process, close attention should be also given to the social contexts in which children encounter and try to cope with stress in future research. This includes both the broad social and economic contexts in which children live, as well as the characteristics of stressful events and conditions with which they are coping.

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