**Original Papers**

*Polish Psychological Bulletin*
2022, vol. 53(2) 112–121
DOI: 10.24425/ppb.2022.141139

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# Coping and Mental Health during Emerging Adulthood. The Relationships between Coping Strategies and Risk of Depression and Life Satisfaction among Students in Higher Education

**Abstract:** Background: The phenomenon of accumulating tasks, characteristic of emerging adulthood, intensifies perceived stress and stimulates coping activity. The nature and intensity of the coping strategies used to deal with challenges can affect mental health in emerging adulthood. The purpose of the study was to investigate the relationship between coping strategies and mental health in a group of emerging adults- students in higher education.

*Methods: The study included 390 emerging adults, students in higher education. Coping strategies were measured with the COPE Questionnaire and information on mental health was called using the Kutcher Adolescent Depression Scale and the Satisfaction with Life Scale. The confirmatory factor analysis (CFA) with maximum likelihood (ML) estimation was used to assess the factor structure of the variables and structural equation modeling was used to test the hypotheses.*

**Results:** The data mostly confirmed the hypotheses. Avoidance strategies turned out to be the strongest predictor of mental health, specifically negative mental health outcomes. Problem-focused strategies were a stronger predictor of quality of life than emotion-focused and support-seeking strategies. Emotion-focused strategies did not predict depression. Coping strategies, especially avoidance strategies, play a crucial role in mental health during emerging adulthood.

**Conclusions:** Learning to cope enables students to deal with difficult tasks and challenges of this period more effectively, and minimizes their risk of depression, and increases their life satisfaction.

**Keywords:** *coping, students, life satisfaction, emerging adulthood, risk of depression, mental health*

## INTRODUCTION

Emerging adulthood is a time of many changes in various spheres of life. These changes are often associated with setting specific goals, the implementation of which gives a sense of satisfaction with family life, love, education, or professional work (Arnett, 2005; Willoughby et al., 2021). These changes can also constitute a source of stress and put the mental health of young people at risk. Early adulthood is characterised by extraordinary vitality, creativity, and flexibility, but it is also a time of contradictions and burdensome, difficult life tasks (Runco & Cayirdag, 2014). Arnett (2020) labelled the developmental period between the end of puberty and adulthood as 'emerging adulthood', arguing that it was a defined period of life for young people in industrialised societies. This period extends from 18 to 29 years and is different from both adolescence, which precedes it, and young adulthood, which follows. Emerging adulthood is a time of identity exploration in various fields, professional, social, and ideological. It is a time of instability, an in-between period when individuals focus on themselves, but also a time when people have great expectations for themselves (Arnett, 2005; Arnett et al., 2014; Arnett & Mitra 2018). Young people exploring various life possibilities gradually arrive at more permanent decisions about love, work, and worldview. Emerging adulthood is a period in which changes and exploration are common, even if the heterogeneity of this period is recognised and examined as one of the distinctive features of emerging adulthood (Arnett, 2000; Reifman et al., 2007). In many respects, it is a period of opportunity, in which the selection of many different potential futures is possible and most people have more personal freedom and opportunity to explore than at any other time. According to Arnett (Arnett, 2000; Syed, 2016) the period of emerging adulthood becomes more

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significant as societies develop economically, because once a certain level of economic development is reached, a country will offer conditions that enable young people to extend the period of exploration, and during this period they are free from the expectations created by roles assumed in adulthood. The pressures of emerging adulthood may be different in various settings. Students often have to move to another city, work, or live with strangers for the first time in their lives. Besides, Arnett notes that college students take on some of the responsibilities of independent living, but leave others to parents, and often live at home with parents some of the time, and away some of the time. During the college years, students question and examine inherited values, retaining and/or revising some, discarding others, and adding new ones.

Often, emerging adults face several tasks at the same time. They feel that they should graduate, become independent from their family, start a career and family of their own. This sense of the accumulation of life tasks, which is heightened when some are postponed. The accumulation of tasks can interfere with the psychosocial functioning of students. The disturbance to their sense of security and stability, living under pressure, and the sense of dissonance between expectations and perceived possibilities can lead to a deterioration in mental health, in the broad sense of the term. Winzer and coauthors (2014) considered mental health to be a state amounting to more than the absence of mental illness. They argued that a mentally healthy state involves the presence of positive outcomes as well as the absence of negative symptoms and that assessments of mental health should encompass both positive and negative indicators. The proposed "Dual Continuum Model" suggests that positive mental health not only implies the absence of mental illness but also constitutes an entity of its own (Winzer et al., 2014). Negative indicators of mental health include symptoms of depression, fear, and anxiety whereas positive indicators include a feeling of satisfaction with life (Friedli, 2009; Kessler et al., 2010; Langford et al., 2014). The term 'mental health' in this survey will be used in its broader sense and analysed in its positive and negative aspects.

Studies show that the incidence of mental illness is higher in this group than in other age groups (Collishaw et al., 2010; Eckersley, 2011), the incidence of stress-related anxiety disorders is higher, as is the incidence of mood disorders, particularly depression (Kessler et al., 2010; Langford et al., 2014). Epidemiological studies suggest that depression affects about 15% of adolescents and young adults, with female adolescents being twice as likely to be affected as males (Hankin et al., 2008; Mojs et al., 2012). Research has demonstrated that students who are entering adulthood are particularly vulnerable to depression (Bardone et al., 1998; Fergusson & Woodward, 2002; Indic et al., 2012; Martínez-Hernáez et al., 2016) and this is reflected in an increased risk of suicide, abuse of psychoactive substances, problems with social adaptation, deterioration of educational and professional achievements; depression in emerging adulthood also increases the risk of serious mental disorders in adult life (Eisenberg et al., 2007; Eisenberg et al., 2013; Hunt & Eisenberg, 2010; Martínez-Hernáez et al., 2016; Verger et al., 2010).

The accumulation of tasks during emerging adulthood intensifies perceived stress. In transactional stress theory, stress is defined as the result of the interplay between a person and the environment (Lazarus & Folkman, 1984). Carver, Scheier, and Weintraub proposed an extensive taxonomy of coping strategies, which includes both dispositional and situational strategies. Initially, the taxonomy included 13 coping strategies, but subsequently, two further strategies were added: a sense of humour and use of drugs or alcohol (Carver, 1997; Carver et al., 1989)

Active coping involves taking actions intended to solve or avoid a problem or change a situation. Planning is thinking about how to deal with stress or how best to handle a problem; planning is also directed to a specific problem but differs from active coping in that the action phase is postponed. Suppression of competing activities is a tactic for avoiding being distracted by other events and includes postponing projects not related to the problem; it also involves focusing on the problem and its solution. Self-control, i.e. refraining from impulsive action (restraint coping) involves postponing action until circumstances are appropriate, refraining from premature action, and self-control. Positive reinterpretation and growth involve perceiving developmental value in an experience or otherwise attempting to see positive aspects of a situation. The seeking instrumental social support strategy involves seeking advice and information that could help one to take action. Seeking emotional social support involves seeking sympathy, understanding, and compassion. The strategy of focusing on and venting emotions is associated with high awareness of negative emotions and a tendency to discharge them in search of catharsis. Acceptance involves accepting the situation as something that cannot be modified, to which one must become accustomed. Denial involves refusing to accept the reality of a stressful situation and ignoring it. Turning to religion is associated with coping by increasing religious observance and can be a source of emotional support or a way of reinterpreting a problem positively. Mental disengagement involves avoiding thinking about a situation by engaging in other activities, and behavioural disengagement implies helplessness, resignation, and giving up on solving a problem or changing a stressful situation. Although the authors themselves were cautious about assigning specific strategies to specific coping styles, they noted that five strategies (active coping, planning, suppression of competing activities, restraint coping, and seeking of instrumental and social support) reflect various aspects of coping that are focused on a problem; five others (seeking of emotional social support, positive reinterpretation, acceptance, denial and turning to religion) can be considered elements of an emotion-focused style; they described the other three (focus on and venting of emotions, behavioural disengagement, and mental disengagement) as less useful (Carver et al., 1989).

Research has demonstrated that coping strategies play an important role in mental health in emerging adulthood.

Vannucci, Flannery, and Ohannessian (2018) showed that avoidance and emotion-focused coping strategies, such as venting emotions and denial, were associated with more severe depressive symptoms, whereas problem-focused strategies (planning, active coping) were not correlated with symptoms of depression until around 17 years of age, and that when a relationship did emerge it was negative. The search for social instrumental and emotional support was negatively associated with symptoms of depression between the ages of 18 and almost 24 years of age. The results of analyses of the relationships between specific coping strategies and depression during adolescence and early adulthood have been mixed. Mahmoud and coauthors (Mahmoud et al., 2012) demonstrated that avoidance coping strategies, such as denial, self-blaming, and substance use, predicted depression and anxiety in a group of students aged 1824 years, whereas problem-focused strategies (acceptance, planning, and positive reframing) were not related to symptoms of depression and anxiety. Research has also shown that coping styles are related to positive mental health indicators. Cabras and Mondo found that first-year Italian university students' satisfaction with life was positively correlated with task-oriented coping and avoidance-oriented coping, and negatively correlated with emotion-oriented coping (Cabras & Mondo, 2018). Tamini and Ansari also observed positive relationships between life satisfaction and task-focused and avoidance-focused coping styles in students group (Kord & Ansari, 2014). Deniz also reported a positive relationship between problem-focused strategies and life satisfaction, as well as a positive relationship between seeking social support and life satisfaction; in this, study life satisfaction was not related to avoidance-focused coping strategies (Deniz, 2006). A study on Malaysian students showed that the avoidance strategy correlated with a higher level of perceived stress (Chai & Low, 2015). Studies demonstrated that students used multiple strategies, mainly praying, meditating, self-distracting activities such as watching TV and listening to music to cope with stress (Kwaah & Essilfie, 2017). Moreover, they were found to use more positive stress coping strategies than negative ones (Yikealo et al., 2018).

**The Study**

Young adults face numerous developmental challenges and tasks related to family, professional or educational life. The strategies they use to deal with challenges can affect their mental health. Understanding how coping strategies are related to depression and life satisfaction may help health and education professionals to promote good mental health. The purpose of the study was to investigate the relationships between coping and mental health in a group of emerging adults using participants who are students in higher education. In line with results of previous studies (Bardone et al., 1998; Deniz, 2006; Fergusson & Woodward, 2002; Indic et al., 2012; Mahmoud et al., 2012), it was assumed that task-orientated strategies would be positively related to life satisfaction (H1) and negatively related to the risk of depression (H2). We also predicted that strategies focused on seeking instrumental and emotional social support would be positively associated with life satisfaction (H3) and negatively with the risk of depression and (H4). However, the relationship between avoidance-based strategies would be positively related to life satisfaction (H5) and positively to the risk of depression (H6).

Structural equation modelling was used to examine the causal effects of coping strategies on mental health. Contrary to previous analyses both the positive and the negative dimensions of mental health were included in one model that allowed us to retain the dichotomic view of mental health and establish which strategies play a crucial role in the prediction of mental health in the group of emerging adults - students in higher education. In the study, we tried to establish how and to what extent task-orientated strategies, avoidance-based strategies, and focused on seeking instrumental and emotional social support strategies have an impact on mental health: the risk of depression and as well as on the level of life satisfaction.

## METHOD

**Participants and procedure**

The study involved 390 University of Bialystok students aged 19-29 years ($M$ = 22.91; $SD$ = 2.08): 131 men (33.6%) and 259 women (66.4%). The overwhelming majority (95%) of participants were full-time students and the remaining 5% were part-time students. The research was conducted among students of Faculty of Education (74%) and Faculty of Law (26%).

Participants were recruited by Internet (via the university mail page) and face to face, by the researcher during the lectures. Those recruited directly received an information sheet from the researcher, which explained the purpose of the study. The researcher informed that participation in the study is voluntary and emphasized participants could withdraw at any time to minimalize being obligated. Participants were also informed that the study is anonymous, individual responses will not be shared with anyone, and the analyses will be subject to aggregate results that will be used solely for scientific purposes. Participants who did not want to participate in the study were given free time. Respondents who were recruited via the Internet received an email containing the same information. Data from the online surveys were collected on the Microsoft Forms platform and then exported to a spreadsheet. All participants gave written consent following the Helsinki Declaration. The research project was approved by the Ethics Committee of the Faculty of Education at the University of Bialystok. Data were collected between September 2018 and June 2019.

**Measures**

***Coping with stress.*** The COPE Questionnaire (Carver, 1997) was used to measure coping strategies. This consists of 60 statements (4 statements about each of 15 strategies). Responses are given using a four-point Likert

scale (1: I almost never do that; 2: I rarely do that; 3: I often do that; 4: I almost always do that). Scores for each strategy thus range from 4 (minimum) to 16 (maximum). Scores of 4 to 6 points indicate that the respondent almost never uses a given strategy, scores of 7 to 9 points that he or she rarely uses, scores of 10 to 12 that he or she often uses it and scores of 13 or more that he or she has a strong tendency to rely on it. In the Polish version of the scale Cronbach's alpha coefficients for the individual strategies were found to range from .48 to .94 and were weakest in the case of the mental disengagement and active coping strategies and the highest for the turning to religion strategy (Juczyński & Ogińska-Bulik, 2012).

***Depression.*** The short version of the Kutcher Adolescent Depression Scale (KADS) is commonly used to screening for the risk of depression amongst young people (Brooks et al., 2003). The scale consists of six items referring to (1) sadness; (2) lack of self-confidence; (3) physical exhaustion; (4) the belief that life is difficult and overwhelming; (5) anxiety; (6) emerging suicidal thoughts and plans. Respondents use a 03 scale to indicate how frequently they experience each emotion, belief or state (0: rarely; 1: sometimes; 2: often; 3: always). Scores of six or more indicate that the respondent is at risk of depression. The reliability (expressed as Cronbach's alpha) of the Polish version was found to be α = .82 (Brooks et al., 2003; Mojs et al., 2015).

***Satisfaction with life.*** Polish adaptation (Juczyński, 2012) of the Satisfaction with Life Scale (SWLS) (Diener et al., 1985)to measure life satisfaction was used. The scale captures global cognitive satisfaction with one's life. The scale consists of five statements to which responses are given using a seven-point Likert scale ranging from 1 (I totally disagree) to 7 (I totally agree). Item scores are summed to yield an overall measure of satisfaction with life; higher scores indicate greater satisfaction with life. The Polish version of the SWLS was shown to have internal reliability of α = .81 (Juczyński, 2012).

**Statistical Analyses**

Confirmatory factor analysis (CFA) with maximum likelihood (ML) estimation, implemented in AMOS 24 was used to assess the factor structure of the variables. Cronbach's alpha coefficients were calculated in SPSS 24. To assess potential gender differences in coping strategies, risk of depression, and satisfaction with life, the Student's t-test was used. Effect sizes were evaluated with Cohen's *d*: effects with $d = .2$ to .5 were interpreted as small, effects with $d = .5$ to .8 were considered medium and effects with $d > .8$ were considered large.

Structural equation modelling in AMOS 24 was used to test the hypotheses. The model parameters were estimated using the maximum likelihood method. Model fit was assessed using the following statistics: GFI, CFI, RMSEA and relative chi-square ($\chi^2/df$) (Brown, 2015; Byrne, 2016; Kline, 2015). The chi-squared statistic ($\chi^2$) was used to assess the sample and the implied covariance matrices; however, this statistic is strongly dependent on the sample size and provides an overly conservative assessment of the model fit. The relative chi-square is also called the normed chi-square. This value equals the chi-square index divided by the degrees of freedom. This index might be less sensitive to sample size. The criterion for acceptance varies across researchers. The acceptable value is less than 5 (Feehan et al., 1994). The comparative fit index (*CFI*) and the goodness-of-fit index (*GFI*) were used to assess the model fit relative to a baseline model in which all variables are uncorrelated and values above .95 indicate good fit, while values above .90 are considered to indicate acceptable fit (Byrne, 2016; Feehan et al., 1994). The root-mean-square error of approximation (*RMSEA*) was also examined. Ideally, these values should be less than .05, but values below .08 are considered acceptable (Brown, 2015; Byrne, 2016).

The tested model included relationships between coping and both risk of depression and life satisfaction. Risk of depression and life satisfaction were introduced into the model as observable variables. Classes of coping strategy, as revealed by the previous CFA of COPE, were included as latent variables. Six paths representing the six hypotheses were involved in the model. The model included a covariance between life satisfaction and risk of depression, covariance between strategy groups: a group of problem-focused strategies and a group of avoidance strategies, as well as a group of problem-focused strategies and a group of strategies related to seeking support and focus on emotions. The model included also the covariance in the group of strategies related to seeking support and focus on emotions: between the strategy of seeking emotional support and the strategy of focusing on emotions and their disclosure.

## RESULTS

**Factor Structure and Reliability of the Measures**

The five-item SWLS was subjected to CFA. The results showed that a one-factor model provided a good fit to the data: $\chi^2(4) = 12.23$; $p = .016$; $\chi^2/df = 3.05$; RMSEA = .073 (low = .028; high = .121; 90% *CI*); GFI = .98; CFI = 0.99. A one-factor model of the KADS also provided a good fit to the empirical data: $\chi^2(8) = 21.88$; $p = .005$; $\chi^2/df = 2.73$; RMSEA = .067 (low = .034; high = .101; 90% *CI*); GFI = .98; CFI = .98. The reliability of the SWLS as measured with Cronbach's alpha was good (α = .87), as was the reliability of the KADS (α = .88).

Additionally, to examine the factor structure of COPE, CFA was used. All 15 strategies for coping with stress were included in the model. The results confirmed that the three-factor model provided an acceptable fit to the data: $\chi^2(60) = 202.12$; $p < .001$; $\chi^2/df = 3.36$; RMSEA = .078 (low = .066; high = .090; 90% *CI*); GFI = .92; CFI = .92. The first factor was made up of five strategies: planning, positive reinterpretation and development, active coping, avoiding competing activities, and acceptance. This group of strategies was identified as problem-focused strategies, PFS (α = .81). The second factor consisted of four strategies: behavioural disengage-

ment, denial, mental disengagement and use of alcohol or other psychoactive substances. This group of strategies was labelled as avoidance focused strategies, AFS (α = .64). The third factor was also made up of four strategies: searching for instrumental social support, searching for emotional social support, focusing on and discharging emotions, and turning to religion. The first two strategies contributing to this factor had the highest factor loadings, so this group of strategies was labelled as being focused on seeking social support and emotions, FESS (α = .72). Factor loadings are presented in Table 1. The sense of humour strategy (factor loading = .11) was not included in the model due to the low load value (below < .3), whilst the refraining from action strategy was excluded because it loaded highly on both factors 1 and 2.

**Table 1.** Load values and COPE factor structure in the studied group

| Strategies | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|
| Planning | .86 | | |
| Active-coping | .79 | | |
| Positive reinterpretation | .76 | | |
| Suppression of competing activities | .67 | | |
| Acceptance | .37 | | |
| Behavioral disengagement | | .75 | |
| Denial | | .64 | |
| Mental disengagement | | .53 | |
| Substance use | | .34 | |
| Instrumental social support | | | .98 |
| Emotional social support | | | .80 |
| Focus on & venting emotions | | | .41 |
| Turning to Religion | | | .30 |

**Descriptive Results**

Table 2 presents overall means and standard deviations for the coping strategies, two indicators of mental health risk of depression and life satisfaction, and separate values for women and men. The most frequently used strategies were active strategies such as positive reinterpretation ($M$ = 11.04, $SD$ = 2.59), planning ($M$ = 10.92, $SD$ = 2.85) and active coping ($M$ = 10.92, $SD$ = 2.85). Strategies focused on seeking both social instrumental support ($M$ = 10.60, $SD$ = 3.17) and emotional support ($M$ = 10.24, $SD$ = 3.69) were also used with similar frequency. These means indicate that the respondents reported frequent use of all the above coping strategies. The students reported that they rarely use avoidance strategies such as behavioural disengagement ($M$ = 7.37, $SD$ = 2.57), denial ($M$ = 7.13, $SD$ = 2.37) and substance use (M = 5.96, $SD$ = 3.22). The data presented in Table 2 demonstrate that the frequency with which a strategy was employed was similar in women and men. Student's $t$-test for independent groups indicated gender differences in use of four coping strategies. Women were more likely to seek instrumental social support ($t(388) = 3.32$; $p < .001$; $M_f$ = 10.97, $SD$ = 3.1; $M_m$ = 9.86, $SD$ = 3.09; Cohen's $d$ = .35, a small effect), to seek emotional social support ($t(388) = 5.12$; $p < .001$; $M_f$ = 10.90, $SD$ = 3.63; $M_m$ = 8.93, $SD$ = 3.45; Cohen's $d$ = .55, medium effect), to focus on and discharge emotions ($t(388) = 3.45$; $p < .001$; $M_f$ = 10.56, $SD$ = 2.5, $M_m$ = 9.57, $SD$ = 2.87; Cohen's $d$ = .36) and to turn to religion ($t(388) = 2.72$; $p < .01$; $M_f$ = 10.01, $SD$ = 4.46, $M_m$ = 8.73, $SD$ = 4.31; Cohen's $d$ = .35, small effect) (Table 2).

The mean score for life satisfaction was 20.22 ($SD$ = 6.23) and the mean score for risk of depression was 5.43 ($SD$ = 4.27). The sample's life satisfaction scores ranged from 5 to 6 sten, indicating average life satisfaction (Juczyński & Ogińska-Bulik, 2012). Overall the sample's scores on the risk of depression scale were low. A study of the Polish version of the KADS (Mojs et al., 2015) concluded that scores of six or more indicated the risk of depression. In the sample, there were no gender differences in satisfaction with life or risk of depression (Table 2).

A correlation analysis showed that the risk of depression was positively associated with focusing on emotions, mental disengagement, denial, behavioural disengagement activity, and the consumption of alcohol or other psychoactive substances, as well as negatively associated with active coping, planning, seeking instrumental and emotional support, avoiding competing activities and positive reinterpretation. The risk of depression was not related to acceptance or turning to religion. Satisfaction with life was positively associated with active coping, planning, seeking instrumental support, seeking emotional support, avoiding competing activities, positive reinterpretation, and turning to religion. In contrast, it was negatively associated with mental, and behavioural disengagement and consumption of alcohol or other psychoactive substances. Satisfaction with life was not related to acceptance, focusing on emotions or denial (Table 3).

**Impact of Coping Strategies on Mental Health**

Next, structural equation modeling was used to test the hypotheses. The model proved an acceptable fit to the data. $\chi^2$ (82) = 288.52; p < .001; $\chi^2$/df = 3.51; RMSEA = .08 (low = .070; high = .091; 90% *CI*); GFI = .911 CFI = .901. The analysis of the path values showed that most of the paths in the model were significant. As expected, risk of depression was explained by avoidance strategies ($\beta$ = .53, $p < .001$) and strategies related to seeking support and focusing on emotions ($\beta$ = -.12, $p < .03$). Problem-focused strategies did not predict risk of depression ($\beta$ = -.10, $p > .05$). Satisfaction with life, as expected, was related to avoidance strategies ($\beta$ = -.27, $p < .001$), problem-focused strategies ($\beta$ =.22, $p < .001$) and strategies focused on seeking support and emotions ($\beta$ = .13, $p < .05$). Altogether coping strategies explained 20% of variance in satisfaction with life and 35% of variance in risk of depression.

**Table 2.** Descriptive statistics and differences in the risk of depression (RD), life satisfaction (SWL), and coping strategies in the group of women and men

| | Whole | group | Male | group | Female | group | |
|---|---|---|---|---|---|---|---|
| | ***M*** | ***SD*** | ***M*** | ***SD*** | ***M*** | ***SD*** | ***t*** |
| SWL | 20.22 | 6.23 | 20.37 | 6.26 | 20.13 | 6.22 | -.35 |
| RD | 5.43 | 4.27 | 5.29 | 4.28 | 5.49 | 4.26 | .45 |
| Active-coping | 10.88 | 2.18 | 10.80 | 2.40 | 10.92 | 2.06 | .53 |
| Planning | 10.92 | 2.85 | 10.66 | 2.80 | 11.05 | 2.86 | 1.26 |
| Suppression of competing activities | 9.74 | 2.43 | 9.69 | 2.37 | 9.82 | 2.53 | -.51 |
| Positive reinterpretation | 11.04 | 2.59 | 10.96 | 2.68 | 11.06 | 2.53 | .36 |
| Acceptance | 10.21 | 2.73 | 10.51 | 2.63 | 10.05 | 2.76 | -1.56 |
| Denial | 7.13 | 2.37 | 7.41 | 2.47 | 6.99 | 2.31 | -1.65 |
| Behavioral disengagement | 7.37 | 2.57 | 7.36 | 2.64 | 7.37 | 2.54 | .01 |
| Mental disengagement | 9.09 | 2.52 | 8.77 | 2.49 | 9.25 | 2.52 | 1.80 |
| Substance use | 5.96 | 3.22 | 6.31 | 3.50 | 5.77 | 3.05 | -1.54 |
| Focus on & venting emotions | 10.23 | 2.72 | 9.57 | 2.87 | 10.56 | 2.57 | 3.45*** |
| Emotional social support | 10.24 | 3.69 | 8.93 | 3.45 | 10.90 | 3.63 | 5.12*** |
| Instrumental social support | 10.60 | 3.17 | 9.86 | 3.09 | 10.97 | 3.14 | 3.32*** |
| Turning to Religion | 9.59 | 4.45 | 8.73 | 4.31 | 10.01 | 4.46 | 2.72** |

*$^{**}p < .01$, $^{***}p < .001$*

**Table 3.** Matrix of correlations between coping strategies and two indicators of mental health, risk of depression (RD) and satisfaction with life (SWL).

| Coping strategy | RD | SWL |
|---|---|---|
| Active-coping | -.25** | .25** |
| Planning | -.31** | .30** |
| Suppression of competing activities | -.18** | .27** |
| Positive reinterpretation | -.35** | .40** |
| Acceptance | -.05 | .05 |
| Denial | .28** | -.09 |
| Behavioral disengagement | .44** | -.34** |
| Mental disengagement | .38** | -.19** |
| Substance use | .21** | -.15** |
| Focus on & venting emotions | .24** | -.10 |
| Emotional social support | -.12* | .22** |
| Instrumental social Support | -.21** | .24** |
| Turning to Religion | -.03 | .16** |
| SWL | -.52** | |

*$^{*}p < .05$ $^{**}p < .01$*

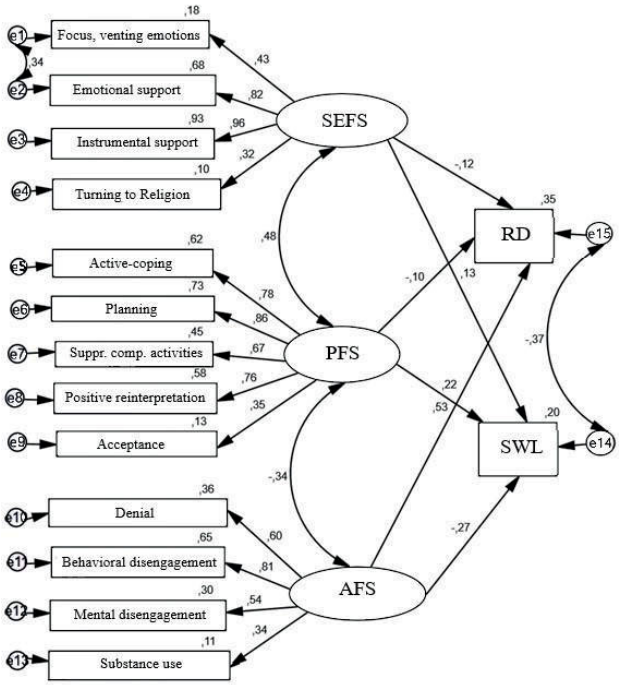


**Figure 1.** The tested model (N=390): Risk of Depression (RD), Satisfaction with Life (SWL) vs. Support & Emotion–Focused Strategies, (SEFS), Problem-Focused Strategies (PFS), Avoidance-Focused Strategies (AFS) of coping with stress

## DISCUSSION

The purpose of our study was to analyse the relationship between coping strategies and mental health in emerging adulthood. Our approach to the assessment of mental health is based on Winzer, Lindblad, Sorjonen, & Lindberg's argument that such assessments should encompass both negative and positive indicators (Winzer et al., 2014). We focused on the risk of depression and life satisfaction among students in higher education. The results mostly supported the hypotheses. Avoidance strategies were an important predictor of both mental health indicators. This is consistent with earlier studies by Mahmoud, Staten, Hall & Lennie, and Vannucci, Flannery & Ohannessian, (Mahmoud et al., 2012; Vannucci et al., 2018), which found that avoidance coping strategies were

positively related to the risk of depression and negatively related to life satisfaction. The hypothesis that the risk of depression would be negatively related to the use of strategies focused on emotions and seeking social support was also confirmed. This group of strategies was also an important positive predictor of life satisfaction. The data are consistent with the results of the studies carried out by Staten, Hall, & Lennie, and Deniz. However, contrary to our hypothesis and previous findings (Cabras & Mondo, 2018; Deniz, 2006; Kord & Ansari, 2014) use of task-oriented strategies did not predict the risk of depression, although it was related to satisfaction with life. It is worth noting that in the tested model avoidance strategies emerged as the strongest predictor of mental health, especially negative symptoms. This implies that the more students are inclined to deny the reality of a stressful situation, ignore it, engage in displacement activities, refrain from any effort to resolve problems or use alcohol or other psychoactive substances in difficult situations, the greater their risk of depression and the lower their satisfaction with life. In contrast seeking advice, information, sympathy or understanding from significant others and, to a lesser extent, focusing on emotions and discharging them or seeking support in religion decrease the risk of depression in emerging adulthood. Moreover, using this group of strategies also increases life satisfaction to a similar degree. In the sample, problem-focused strategies were a stronger predictor of satisfaction with life than the group of strategies focused on emotions and seeking support. In other words, the more students are inclined to reflect on and confront the challenges ahead, and to see their positive aspects and developmental possibilities, the greater their well-being.

The present study examined the causal effects of coping strategies on mental health. Since a healthy mental state involves not only the absence of negative symptoms but also the presence of positive outcomes, it is crucial that the tested model included both dimensions of mental health. In the study, we tried to establish how and to what extent different groups of coping strategies influence the risk of depression as well as the level of life satisfaction. The results demonstrated that avoidance strategies have the strongest impact on both dimensions of mental health. The use of these strategies in the period of emerging adulthood not only substantially increases the risk of depression but also significantly reduces subjective satisfaction with life. However, the relationship between avoidance strategies and the negative indicator of mental health was much stronger than the relationship with the positive indicator. Problem-focused strategies had a stronger impact on life satisfaction than on the risk of depression, whereas the impact of strategies oriented towards emotions and social support were comparable on both indicators of mental health.

**Implications**

Emerging adulthood is a difficult time for young people, a time of confrontation with many problems in different areas of life. One study indicated that about 36% of young people meet the diagnostic criteria for mental disorders (Feehan et al., 1994) although most estimates range between 10% and 20% (Wille et al., 2008). The global Covid-19 pandemic imposes additional burdens on young people. Research conducted among Chinese adolescents showed that over 22% indicated clinical symptoms of depression, while the average frequency of depressive symptoms in this population in the period preceding the pandemic was 13%. The adolescents also reported more symptoms of anxiety compared to the period before the pandemic (Duan et al., 2020). A study conducted among American students found that about 88% of students experienced moderate to severe stress, with 44% of students showing moderate to severe anxiety and 36% of students having moderate to severe depression symptoms (Lee et al., 2021). In another research, clinically relevant depressive symptoms among German students were reported by 37% of respondents and suicidal thoughts were indicated by 15% of students (Kohl et al., 2021). It is therefore important that young people develop appropriate coping strategies because, as our research has shown, the strategies they use have an impact on their mental health.

The results demonstrated that during emerging adulthood, especially in the group of well-educated emerging adults, it is extremely important to minimise the tendency to use avoidance-based coping strategies and to encourage young adults to rely on more adaptive strategies. Developing the ability to cope with difficult situations should constitute an integral part of intervention aimed at improving the mental health of young adults. High school and university authorities could take advantage of existing interventions that are effective. There are several noteworthy intervention programmes designed to support coping skills, for example, 'Bright Ideas' (Brandon et al., 1999; Frydenberg & Brandon, 2002). TRAVELLERS' (Dickinson et al., 2003), Best of Coping' (Frydenberg & Brandon, 2002) and 'COPE' (Melnyk et al., 2007, 2015). Their primary goal is to teach participants a positive way of thinking and active, problem-focused coping strategies. Important aspects of these programmes include learning to set goals, assertiveness training, social skills training and training in stress relief and relaxation techniques. The 'Best of Coping' programme focuses on developing participants' ability to assess stress coping strategies and choose the most appropriate strategy to deal with stress in given conditions (Frydenberg & Brandon, 2002). The authors of 'Bright Ideas' argue that an optimistic attribution style is the key to dealing successfully with stressors and functioning effectively in the face of adversity (Brandon et al., 1999; Cunningham et al., 2010). A similar assumption underlies the COPE programme, which aims to teach participants to suppress negative thoughts and develop a positive attitude (Melnyk et al., 2007, 2015). Dickinson, Coggan, & Bennett noted that properly conducted interventions can help to strengthen protective factors and coping strategies based on seeking social support. In general empirical studies suggest that these programmes are highly effective. Two studies found that implementing these programmes as

part of academic classes led to a reduction in depression and anxiety, and better academic performance, which ultimately increases the likelihood of graduation (Erlich et al., 2019; Hart Abney et al., 2019). The results of the present research support the argument programmes aimed at developing proper coping strategies should be widely implemented as they demonstrate the importance of strategies to mental health during emerging adulthood. Learning to cope not only enables people to deal with burdensome, difficult tasks and challenges more effectively, but also minimises their risk of depression and increases their life satisfaction.

**Strengths, Limitations, and Future Directions**

The results of the present study may help to improve understanding of the impact of coping with stress on mental health in emerging adulthood. First of all, our results show that in stressful situations, emerging adults most often use active strategies that allow them to deal effectively with the challenges and difficulties of personal, social, family, academic, and professional life. Importantly, the preference for active strategies does not depend on gender. Strengthening and developing emerging adults' ability to use this type of coping strategy is immensely important because it leads to an increase in their wellbeing. Secondly, even though emerging adults rarely use avoidance strategies, the consequences of doing so are extremely serious. Our research showed that avoidance strategies were the strongest predictor of both positive and negative mental health indicators. Therefore, in the interests of the mental health of emerging adults, interventions should focus on discouraging the use of avoidance strategies.

Turning to the limitations of our research, we must note that we identified respondents' preferred coping strategies, but we did not investigate the types of stressors they faced, which may influence the effectiveness of particular coping strategies. The limitations of our research also include the number of factors considered as possible determinants of mental health. Just one negative indicator of mental health the risk of depression and one positive indicator life satisfaction were measured. In further studies, it would be worth including additional positive and negative indicators of mental condition, such as self-esteem, self-efficacy, sense of coherence, anxiety, and body acceptance. It should also be noted that the sample mainly comprised students and young adults with higher education, which limits the applicability of our conclusions to the population of well-educated emerging adults. This population may differ from non-students in terms of motivational factors and the types of stressor experienced. Further research should investigate the non-student, non-graduate population of young adults and compare the results with the findings we obtained in our student sample.

As shown by previous studies, individuals deal with many types of stressors in emerging adulthood and the effectiveness of their preferred coping strategies is variable (Vannucci et al., 2018). It would be worth carrying out longitudinal studies, covering the entire period of emerging adulthood to gain further insight into the effectiveness of particular coping strategies and groups of coping strategies during this period of life. It would also be worth conducting experimental studies to determine the cause-effect relationships between the variables investigated in this study.

## CONCLUSIONS

Coping strategies are significant predictors of mental health among young adults. These results highlight the importance of promoting coping strategies to increase life satisfaction and minimize the risk of depression during emerging adulthood. Education, that supports problem and active coping skills and skills connected with seeking social support can be valuable in reducing negative mental health indicators and improving quality of life.

## REFERENCES


Arnett, J. J. (2005). The developmental context of substance use in emerging adulthood. *Journal of Drug Issues*, *35*(2), 235–254. https://doi.org/10.1177/002204260503500202

Arnett, J. J., & Mitra, D. (2018). Are the features of emerging adulthood developmentally distinctive? A comparison of ages 18–60 in the United States. *Emerging Adulthood*, 8(5), 412-419. https://doi.org/10.1177/2167696818810073

Bardone, A. M., Moffitt, T. E., Caspi, A., Dickson, N., Stanton, W. R., & Silva, P. A. (1998). Adult physical health outcomes of adolescent girls with conduct disorder, depression, and anxiety. *Journal of the American Academy of Child & Adolescent Psychiatry*, *37*(6), 594–601. https://doi.org/10.1097/00004583-199806000-00009

Brandon, C. M., Cunningham, E. G., & Frydenberg, E. (1999). Bright Ideas: A school-based program teaching optimistic thinking skills in pre-adolescence. *Journal of Psychologists and Counsellors in Schools*, *9*(S1), 147–158. https://doi.org/10.1017/S10372911 0000306X

Brooks, S. J., Krulewicz, S. P., & Kutcher, S. (2003). The Kutcher Adolescent Depression Scale: Assessment of its evaluative properties over the course of an 8-week pediatric pharmacotherapy trial. *Journal of Child and Adolescent Psychopharmacology*, *13*(3), 337–349. https://doi.org/10.1089/104454603322572679

Brown, T. A. (2015). *Confirmatory Factor Analysis for Applied Research*. Guilford Publications.

Byrne, B. M. (2016). *Structural Equation Modeling With AMOS: Basic Concepts, Applications, and Programming, Third Edition*. Routledge.

Cabras, C., & Mondo, M. (2018). Coping strategies, optimism, and life satisfaction among first-year university students in Italy: Gender and age differences. *Higher Education*, *75*(4), 643–654. https://doi.org/10.1007/s10734-017-0161-x

Carver, C. S. (1997). You want to measure coping but your protocol'too long: Consider the brief cope. *International Journal of Behavioral Medicine*, *4*(1), 92. https://doi.org/10.1207/s15327558ijbm0401_6

Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*, *56*(2), 267. https://doi.org/10.1037/0022-3514.56.2.267

Chai, M. S., & Low, C. S. (2015). Personality, coping and stress among university students. *American Journal of Applied Psychology*, *4*(3–1), 33–38. https://doi.org/10.11648/j.ajap.s.2015040301.16

Collishaw, S., Maughan, B., Natarajan, L., & Pickles, A. (2010). Trends in adolescent emotional problems in England: A comparison of two national cohorts twenty years apart. *Journal of Child Psychology and*

*Psychiatry*, *51*(8), 885–894. https://doi.org/10.1111/j.1469-7610.2010.02252.x

Cunningham, E. G., Brandon, C. M., & Frydenberg, E. (2010). Enhancing coping resources in early adolescence through a school-based program teaching optimistic thinking skills. *Anxiety, Stress & Coping*, *15*(4), 369–381. https://doi.org/10.1080/10615800 21000056528

Deniz, M. (2006). The relationships among coping with stress, life satisfaction, decision-making styles and decision self-esteem: An investigation with Turkish university students. *Social Behavior and Personality: An International Journal*, *34*(9), 1161–1170. https://doi.org/10.2224/sbp.2006.34.9.1161

Dickinson, P., Coggan, C., & Bennett, S. (2003). TRAVELLERS: A school-based early intervention programme helping young people manage and process change, loss and transition. Pilot phase findings. *Australian & New Zealand Journal of Psychiatry*, *37*(3), 299–306. https://doi.org/10.1046/j.1440-1614.2003.01181.x

Diener, E. D., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, *49*(1), 71–75.

Duan, L., Shao, X., Wang, Y., Huang, Y., Miao, J., Yang, X., & Zhu, G. (2020). An investigation of mental health status of children and adolescents in China during the outbreak of COVID-19. *Journal of Affective Disorders*, *275*, 112–118. https://doi.org/10.1016/j.jad.2020.06.029

Eckersley, R. (2011). Troubled youth: An island of misery in an ocean of happiness, or the tip of an iceberg of suffering? *Early Intervention in Psychiatry*, *5*, 6–11. https://doi.org/10.1111/j.1751-7893.2010.00233.x

Eisenberg, D., Gollust, S. E., Golberstein, E., & Hefner, J. L. (2007). Prevalence and correlates of depression, anxiety, and suicidality among university students. *American journal of orthopsychiatry*, *77*(4), 534-542. https://doi.org/10.1037/0002-9432.77.4.534

Eisenberg, D., Hunt, J., & Speer, N. (2013). Mental health in American colleges and universities: variation across student subgroups and across campuses. *The Journal of nervous and mental disease*, *201*(1), 60-67. https://doi.org/10.1097/NMD.0b013e31827ab077

Erlich, K. J., Li, J., Dillon, E., Li, M., & Becker, D. F. (2019). Outcomes of a Brief Cognitive Skills-Based Intervention (COPE) for Adolescents in the Primary Care Setting. *Journal of Pediatric Health Care*, *33*(4), 415–424. https://doi.org/10.1016/j.pedhc.2018.12.001

Feehan, M., McGee, R., Raja, S. N., & Williams, S. M. (1994). DSM-III-R disorders in New Zealand 18-year-olds. *Australian and New Zealand Journal of Psychiatry*, *28*(1), 87–99. https://doi.org/10.3109/00048679409075849

Fergusson, D. M., & Woodward, L. J. (2002). Mental health, educational, and social role outcomes of adolescents with depression. *Archives of General Psychiatry*, *59*(3), 225–231. https://doi.org/10.1001/archpsyc59.3.225

Friedli, L., & World Health Organization. (2009). *Mental health, resilience and inequalities* (No. EU/08/5087203). Copenhagen: WHO Regional Office for Europe.

Frydenberg, E., & Brandon, C. (2002). *The Best of Coping: Developing Coping Skills for Adolescents. Instructor's Manual*. Oz Child.

Hankin, B. L., Wetter, E., & Cheely, C. (2008). *Sex differences in child and adolescent depression: A developmental psychopathological approach.* In J. R. Z. Abela & B. L. Hankin (Eds.), *Handbook of depression in children and adolescents*, 377–414. The Guilford Press.

Hart Abney, B. G., Lusk, P., Hovermale, R., & Melnyk, B. M. (2019). Decreasing Depression and Anxiety in College Youth Using the Creating Opportunities for Personal Empowerment Program (COPE). *Journal of the American Psychiatric Nurses Association*, *25*(2), 89–98. https://doi.org/10.1177/1078390318779205.

Hunt, J., & Eisenberg, D. (2010). Mental health problems and help-seeking behavior among college students. *Journal of adolescent health*, *46*(1), 3-10. https://doi.org/10.1016/j.jadohealth.2009.08.008

Indic, P., Murray, G., Maggini, C., Amore, M., Meschi, T., Borghi, L., Baldessarini, R. J., & Salvatore, P. (2012). Multi-scale motility amplitude associated with suicidal thoughts in major depression. *PLoS One*, *7*(6), e38761. https://doi.org/10.1371/journal.pone.0038761

Juczyński, Z. (2012). *Narzędzia Pomiaru w Promocji i Psychologii Zdrowia*. Pracownia Testów Psychologicznych.

Juczyński, Z., & Ogińska-Bulik, N. (2012). *Narzędzia pomiaru stresu i radzenia sobie ze stresem*. Pracownia Testów Psychologicznych Polskiego Towarzystwa Psychologicznego. http://scholar.google.com/scholar?cluster=6997986605580809144&hl=en&oi=scholar

Kessler, R. C., McLaughlin, K. A., Green, J. G., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., Aguilar-Gaxiola, S., Alhamzawi, A. O., Alonso, J., & Angermeyer, M. (2010). Childhood adversities and adult psychopathology in the WHO World Mental Health Surveys. *The British Journal of Psychiatry*, *197*(5), 378–385. https://doi.org/10.1192/bjp.bp.110.080499.

Kline, R. B. (2015). *Principles and Practice of Structural Equation Modeling*. Guilford Publications.

Kohls, E., Baldofski, S., Moeller, R., Klemm, S.-L., & Rummel-Kluge, C. (2021). Mental Health, Social and Emotional Well-Being, and Perceived Burdens of University Students During COVID-19 Pandemic Lockdown in Germany. Frontiers in Psychiatry, 12, 441. https://doi.org/10.3389/fpsyt.2021.643957

Kord, T., Bahman, & Ansari, A. (2014). Relationship of Stress Coping Strategies and Life Satisfaction among Students. *International Journal of Psychology.* 8(1). 156-165.

Kwaah, C. Y., & Essilfie, G. (2017). Stress and Coping Strategies among Distance Education Students at the University of Cape Coast, Ghana. *Turkish Online Journal of Distance Education*, *18*(3), n3. 120-134.

Langford, R., Bonell, C. P., Jones, H. E., Pouliou, T., Murphy, S. M., Waters, E., Komro, K. A., Gibbs, L. F., Magnus, D., & Campbell, R. (2014). The WHO Health Promoting School framework for improving the health and well-being of students and their academic achievement. *Cochrane Database Syst Rev*, *4*(4), CD008958. https://doi.org/10.1002/14651858.CD008958.pub2.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer Publishing Company, Inc.

Lee, J., Jeong, H.J., & Kim, S. (2021) Stress, Anxiety, and Depression Among Undergraduate Students during the COVID-19 Pandemic and their Use of Mental Health Services. *Innovative Higher Education,* 46, 519–538. https://doi.org/10.1007/s10755-021-09552-y

Mahmoud, J. S. R., Staten, R. "Topsy," Hall, L. A., & Lennie, T. A. (2012). The relationship among young adult college students' depression, anxiety, stress, demographics, life satisfaction, and coping styles. *Issues in Mental Health Nursing*, *33*(3), 149–156. https://doi.org/10.3109/01612840.2011.632708

Martínez-Hernáez, A., Carceller-Maicas, N., DiGiacomo, S. M., & Ariste, S. (2016). Social support and gender differences in coping with depression among emerging adults: A mixed-methods study. *Child and Adolescent Psychiatry and Mental Health*, *10*(1), 2. https://doi.org/10.1186/s13034-015-0088-x

Melnyk, B. M., Jacobson, D., Kelly, S. A., Belyea, M. J., Shaibi, G. Q., Small, L., O'Haver, J. A., & Marsiglia, F. F. (2015). Twelve-month effects of the COPE healthy lifestyles TEEN program on overweight and depressive symptoms in high school adolescents. *Journal of School Health*, *85*(12), 861–870. https://doi.org/10.1111/josh.12342

Melnyk, B. M., Small, L., Morrison-Beedy, D., Strasser, A., Spath, L., Kreipe, R., Crean, H., Jacobson, D., Kelly, S., & O'Haver, J. (2007). The COPE Healthy Lifestyles TEEN program: Feasibility, preliminary efficacy, & lessons learned from an after school group intervention with overweight adolescents. *Journal of Pediatric Health Care*, *21*(5), 315–322. https://doi.org/10.1016/j.pedhc.2007.02.009.

Mojs, E., Bartkowska, W., Kaczmarek, Łukasz D., Ziarko, M., Bujacz, A., & Warchoł -Biedermann, K. (2015). Właściwości psychometryczne polskiej wersji skróconej Skali Depresji Kutchera dla Młodzieży (Kutcher Adolescent Depression Scale) – pomiar depresji w grupie studentów. *Psychiatria Pol*ska *49*(1), 135 – 144. https://doi.org/10.12740/PP/22934

Mojs, E., Warchol-Biederman, K., & Samborski, W. (2012). Prevalence of depression and suicidal thoughts amongst university students in Poznan, Poland, preliminary report. *Psychology*, *3*(02), 132. https://doi.org/10.4236/psych.2012.32020

Reifman, A., Arnett, J. J., & Colwell, M. J. (2007). Emerging adulthood: Theory, assessment and application. *Journal of Youth Development*, *2*(1), 37-48. https://doi.org/10.5195/JYD.2007.359

Runco M.A., Cayirdag N. (2014) Creativity in Adulthood. In: Gullotta T.P., Bloom M. (eds) Encyclopedia of Primary Prevention and Health Promotion. Springer, Boston, MA. https://doi.org/10.1007/978-1-4614-5999-6_66

Syed, M. (2016). Emerging adulthood: Developmental stage, theory, or nonsense? In J. J. Arnett (Ed.), *The Oxford handbook of emerging adulthood* (pp. 11–25). Oxford University Press.

Vannucci, A., Flannery, K. M., & McCauley Ohannessian, C. (2018). Age-varying associations between coping and depressive symptoms throughout adolescence and emerging adulthood. *Development and Psychopathology*, *30*(2), 665–681. https://doi.org/10.1017/S0954579417001183

Verger, P., Guagliardo, V., Gilbert, F., Rouillon, F., & Kovess-Masfety, V. (2010). Psychiatric disorders in students in six French universities: 12-month prevalence, comorbidity, impairment and help-seeking. *Social psychiatry and psychiatric epidemiology*, *45*(2), https://doi.org/189-199. 10.1007/s00127-009-0055-z

Wille, N., Bettge, S., Ravens-Sieberer, U., & Group, B. S. (2008). Risk and protective factors for children's and adolescents' mental health: Results of the BELLA study. *European Child & Adolescent Psychiatry*, *17*(1), 133–147. https://doi.org/10.1007/s00787-008-1015-y.

Willoughby, B. J., Augustus, R. A., & Arnett, J. J. (2021). Overview of Emerging Adulthood. *The Routledge Handbook of Family Communication*.

Winzer, R., Lindblad, F., Sorjonen, K., & Lindberg, L. (2014). Positive versus negative mental health in emerging adulthood: A national cross-sectional survey. *BMC Public Health*, *14*(1), 1238. https://doi.org/10.1186/1471-2458-14-1238

Yikealo, D., Tareke, W., & Karvinen, I. (2018). The level of stress among college students: A case in the college of education, Eritrea Institute of Technology. *Open Science Journal*, *3*(4)