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# Associations between nature connectedness and mental health – mediating effects of coping strategies

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**Abstract**

**Aim of the study:** The study aimed to clarify the relationships between experienced nature connectedness (NC) and depression, anxiety and stress levels with mediating role of coping strategies.

**Subject or material and methods:** Study group included 81 young adults (Mean = 28.02; SD 8.22) who completed questionnaires measuring nature connectedness, coping strategies, well-being, and mental illness. To verify whether the associations between connectedness to nature (measured by CNS) and mental health status (stress, anxiety and depression measured by DASS-21) are mediated by coping strategies parallel mediation analysis was employed. Following three coping strategies as mediators were tested: problem-focused coping strategy, emotion-focused coping strategy, avoidant-focused coping strategy.

**Results:** Results showed a significant mediation of the association between nature connectedness and mental health via coping strategies. The study indicated that: 1) NC was indirectly related to stress and depression through its relationship with the problem-focused coping; 2) NC was neither directly nor indirectly associated with anxiety symptoms.

**Discussion:** The health and wellbeing benefits of contact with nature are becoming increasingly recognized in psychology and medicine. Nevertheless, until now researchers haven't clearly recognized underlying mechanisms of nature-related mental health well-being. Presented study indicate one of the key pathways of associations.

**Conclusions:** The findings support thesis that nature connectedness seems to be a mental health protective factor.

**nature connectedness; anxiety; stress; depression; coping**

## INTRODUCTION

Humankind turns to nature in many ways through reflections or activities involving contact with nature. Recent research brought new or in-depth findings concerning human-nature relations [1-5]. Some studies indicated that contact with nature can bring protective factors for mental health issues in a high-stress context [6]. Some authors even postulate that the new definition of mental health should contain reference to universal values of human society, which correspond to the nature and social connectedness definitions (such as: "respect and care for oneself and other living beings; recognition of con-

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nectedness between people; respect for the environment; respect for one's own and others' freedom" [7, p. 409; 8].

Until now the obtained study results underline positive and significant relationship between nature connectedness and individual happiness, well-being and mental health indicators [9,10], but still the data is relatively scarce. Thus, we have not developed any clearly proved theoretical model of nature-connected mental health. Furthermore, we do not know to what extent the contact with nature (direct and indirect) could be effective in clinical context, there is no guidelines evidence-based practices or interventions within mental health service. As nature connectedness is expressed in many ways worldwide, the cross-cultural differences must be kept in mind – e.g. Western attitudes toward nature are based on specific climatic experiences, Christian and anthropocentric ideas [11].

On the one hand, people relate to nature: physically, cognitively, and emotionally [1,2,12]. On the other hand, close relationships are basic and crucial for individual development, as people relate to their own environment in different ways during lifetime. Many studies showed that human-nature relationships foster human well-being and promote resilience for mental illness [1,2].

### Nature connectedness and mental health

Nature connectedness has been defined as a subjective sense of oneness or unity with nature and refer to the following components: (1) sense of belonging, (2) merging the nature and the self, self-transcendence – dissolution of the conceptual boundaries between the self and the natural environment, (3) subjective individuals' view on the meaning of connectedness [1,9,13]. According to Wilson's biophilia hypothesis, there exists an evolution-based biological mechanism that supports human innate attraction to nature [14, 15].

Nature connectedness may function as a protective factor on mental health in terms of psychological distress, depressive mood, and anxiety state. Empirical support for this idea comes from worldwide research showing that higher sense of bonding with nature corelates with higher well-being and better mental health [1,2].

### Coping strategies

While most earlier studies assessed coping strategies and its importance for mental health in different groups in many context [among others: 16-18], investigating the particular coping strategies as mediators of associations nature connectedness (NC), and mental health (MH) may offer more differentiated insights regarding its beneficial effect. To the author knowledge, the individual contributions of the subscale/ subtypes of coping strategies as mediators NC and MH associations have not been studied so far.

In correspondence of the above, the current study aimed to test mediating model of the association between nature connectedness (NC) and mental health symptoms (MH). Thus, we hypothesized that the coping strategies (in particular, problem-focused and emotion-focused coping strategy) mediate the relationship between connectedness to nature and mental health status (stress, anxiety and depression). The identification of mediators can play a crucial role in developing innovative conceptualizations of nature-based intervention model, targets and doses. In the future, the promotion the development and maintenance of a bond with nature for people of all ages may become one of the main factors for consisted mental health prevention model.

## METHOD

### Study Design and Participants

This cross-sectional, observational study was conducted within adult Poles. An online semi-structured questionnaire was developed by using Google forms (due to epidemiological restrictions), with an informed consent form appended to it. The Maria Grzegorzewska University of Ethics Committee approved the study procedures (Approval number: 44/2021). This study was conducted in accordance with the Declaration of Helsinki. The procedures were clearly explained, and participants could interrupt or quit the survey at any point without explaining their reasons for doing so. Confidentiality was maintained by omitting personal identifiers.

The sample was consisted of 81 people: 62 females and 19 males. The age ranged from 19 to 57 years (M= 28.02; SD = 8.22). 37% of them were students and almost 30% were employed. Nearly 41 % of participants were single, living with a close family (58,02%). More than half of participants lived in the biggest cities in Poland, including capital city (61,73%). Forty-two participants (51,85%) declared that they had had a higher education completed (bachelor or master's degrees). Thirty participants suffer from chronic illness (physical: 16.05%; mental: 11.11%; both: 9.88%). Characteristics of the participants are presented in Table 1.

**Table 1.** Socio-demographic characteristics of the study sample (N = 81)

| Socio-demographics | Category | Frequency | % |
|---|---|---|---|
| Gender | Female | 62 | 76.5% |
| | Male | 19 | 23.5% |
| Marital status | Single | 33 | 40.74% |
| | Informal relationship | 26 | 32.10% |
| | Married | 20 | 24.69% |
| | Divorced | 2 | 2.47% |
| Education | Primary | 1 | 1.23% |
| | Secondary | 27 | 33.33% |
| | Post-secondary/vocational | 10 | 12.35% |
| | Higher vocational/ Bachelor's degree | 16 | 19.75% |
| | Higher master's degree | 26 | 32.10% |
| | Doctoral degree | 1 | 1.23% |
| Place of residence | Village | 18 | 22.22% |
| | Small town (< 20 thousand inhabitants) | 6 | 7.41% |
| | Medium city (20-100 thousand inhabitants) | 7 | 8.64% |
| | Large city (100-350 thousand inhabitants) | 20 | 24.69% |
| | Very large city (> 350 thousand inhabitants) | 13 | 16.05% |
| | Capital city | 17 | 20.99% |
| Residence situation | Alone | 8 | 9.88% |
| | Dorm | 2 | 2.47% |
| | With close family (parent(s), siblings, spouse, children) | 47 | 58.02% |
| | With partner | 10 | 12.35% |
| | With roommate(s) | 14 | 17.28% |
| Employment status | Unemployed | 6 | 7.41% |
| | Student | 30 | 37.04% |
| | Internship/ voluntary work | 2 | 2.47% |
| | Retired/ pensioner | 1 | 1.23% |
| | Contract for specific work/mandate | 5 | 6.17% |
| | Self-employment | 13 | 16.05% |
| | Contract of employment | 24 | 29.63% |

| | | | | |
|---|---|---|---|---|
| Health status | Healthy | | 43 | 53.09% |
| | Somatic illness (e.g., diabetes, heart disease) | | 13 | 16.05% |
| | Mental illness (e.g., anxiety disorder, depression) | | 9 | 11.11% |
| | Both somatic and mental illness | | 8 | 9.88% |
| | Don't know, during diagnosis for a somatic or mental illness | | 8 | 9.88% |
| Age | Mean (SD) | Mdn | Q1; Q3 | Min-max |
| | 28.02 (8.22) | 24.00 | 22; 33 | 19-57 |

## MEASUREMENTS

The online questionnaire covered several areas: (1) general sociodemographic data, including general health condition; (2) nature connectedness (NC) measured by the Connectedness to Nature Scale (CNS) [13]; (3) mental health (MH) – symptoms of depression, anxiety and stress, measured by The Depression, Anxiety, Stress Scale (DASS-21) [19]; (4) coping strategies measured by Mini-COPE (the Coping Orientation to Problems Experienced questionnaire) [20,21].

### Nature connectedness (NC)

The 14 items of Connectedness to Nature Scale (CNS) measure an individual's experience of connection with nature [13]. The CNS uses a 5-point rating scale, ranging from "completely disagree" to "completely agree". The written consent to use the CNS in research were obtained (from C.P.Frantz). The procedure of two-way translation was implemented. In the first step, a native Polish-speaking translator with excellent English language skills made the Polish translation. In the second step, a back translation of the Polish version into English by an independent English-speaking translator with excellent Polish language skills were obtained. At the end, both English versions were revised in terms of linguistic ambiguities. After introducing the professional translator's amendments, the final Polish versions of CNS were obtained.

### Mental health (MH)

The Depression, Anxiety, Stress Scale (DASS-21) is 21-item clinical assessment with three self-report scales designed to measure the emotional states of depression, anxiety, and stress. The depression subscale examined the loss of motivation and self-esteem. The anxiety subscale addresses symptoms of persistent anxiety and fear. The stress subscale measures symptoms of persistent arousal and irritability. Each of the three scales contains seven items, divided into subscales with similar content. All subscales are rated on a four-point Likert scale [19].

### Mediators – coping strategies

While researchers are paying attention to nature connectedness, the psychological processes mediating nature connectedness and mental health are poorly understood, despite the fact that these may be promising targets for psychological treatment [22, 23, 24]. The current study focused on a group of potential psychological mediators between NC and MH, namely Problem-focused coping, Emotion-focused coping, Avoidant-focused coping.

The Coping Orientation to Problems Experienced questionnaire (Mini-COPE) was used to measure dispositional coping [20, 21]. It consists of 28 statements included in 14 strategies (2 statements in each strategy). Coping strategies measured by MINI-COPE are: active coping, planning, seeking instrumental support, seeking emotional support, positive re-evaluation, acceptance, a sense of humor, the return to religion, substitute activities, denial, discharge, substance use, cessation of operations, blaming oneself. The half-time reliability of the Polish version of Mini-COPE was 0.86 and consistency was satisfactory for most of the scales [25].

### Statistical analyses

To verify whether the associations between connectedness to nature (CNS) and mental health status (stress, anxiety and depression – DASS-21) are mediated by coping strategies parallel mediation analysis was employed [26-30]. More specifically, three mediation models for all dependent variables were tested wherein three mediators (M; problem-focused coping; emotion-focused coping; avoidant coping) were proposed to explain the relationship between an independent variable (X; connectedness to nature) and an outcome variables (Y; stress, anxiety, depression; see Figure 1). In parallel mediation, there were as many indirect effects as there were mediators: a1b1, a2b2, and a3b3 pathways for M1, M2, and M3 respectively. Thus, there were three possible indirect effects: one through each coping strategy.

The parallel mediation analysis was performed using the macro tool (PROCESS) for SPSS software [27]. This procedure allowed to estimate in addition to the indirect effect also effect of X on M (see paths a1-3 Fig. 1), effect of M on Y (see paths b1-3 Fig.1), direct effect of X on Y (see path c′ Fig. 1), and total effect (c path Fig.1) which is the sum of the direct and indirect effects, c′+ ab [27]. Current approaches to mediation analysis do not require the assumption of statistically significant path and/or path b and c to conclude the indirect effect [27, p.122].

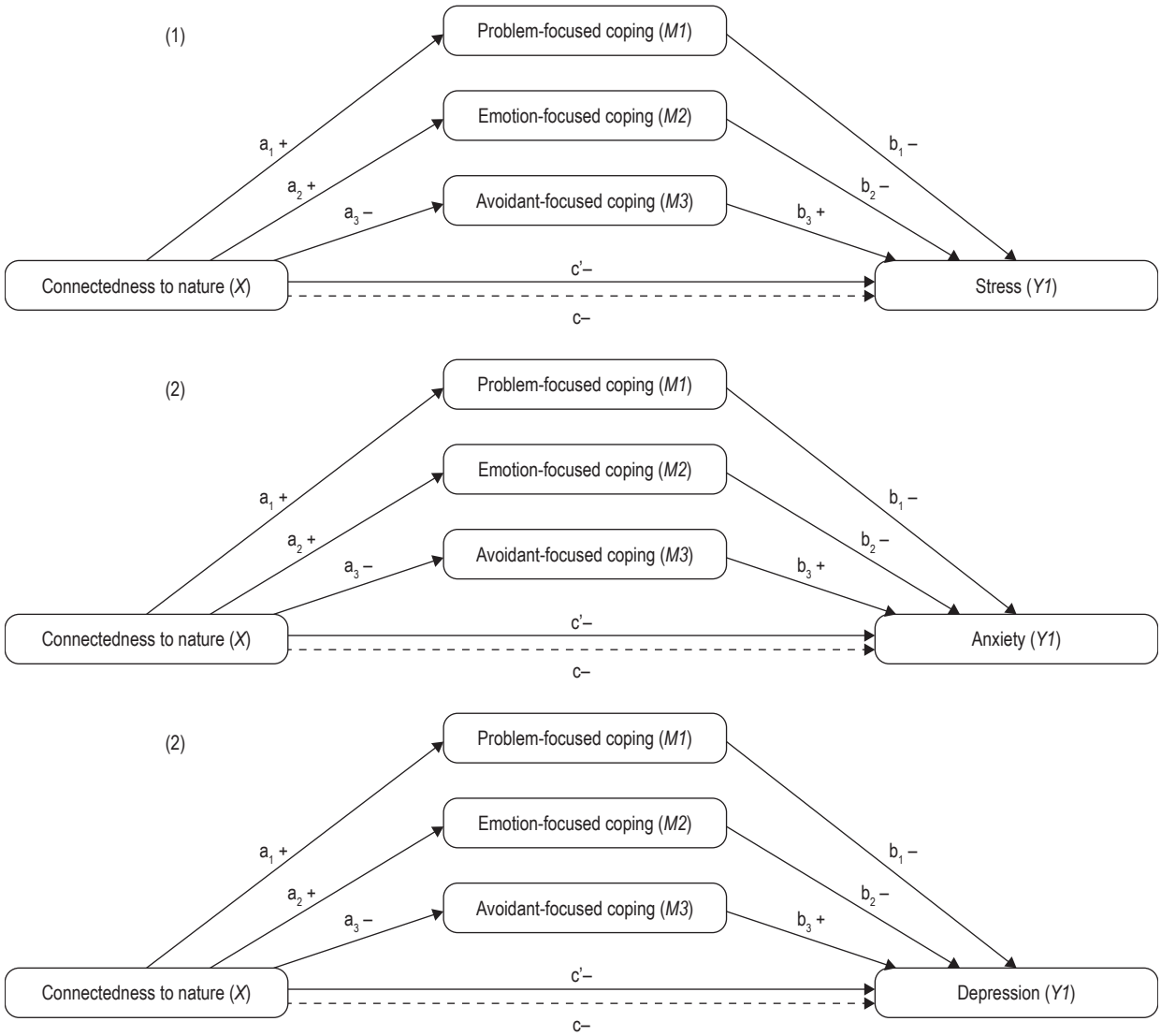


**Figure 1.** Postulated Mediational Path Model. The mediating effects of three coping strategies in the relationship between connectedness to nature and (1) Stress; (2) Anxiety; (3) Depression.

Accurate inferences about the indirect effect rely on methods that acknowledge the non-normality of the sampling distribution [31]. In the analysis, a bootstrap procedure was employed, drawing 10,000 samples and determining 95% percentile confidence intervals for mediation effects (95% confidence interval; 95% CI) as being one of the more frequently recommended approaches [27, 32, 33]. The mediation effect was considered significant at the $p < 0.05$ level when the confidence interval determining the effect size did not contain zero [29, 32].

The direct effect of the independent variable (NC measured by CNS) on the dependent variables (stress, anxiety, and depression measured by DASS-21) as well as the indirect and total effects are estimated [27, 29, 30].

To verify the indirect effects of coping strategies between CNS and DASS subscales the computational procedure was run three times, each time including one of the DASS variables as the dependent variable (Y). Three factors were introduced simultaneously as mediators: problem-focused coping, emotion-focused coping, avoidant-focused coping (see Figure 1).

## RESULTS

### Mediating effects of coping strategies

#### Associations between NC and stress

The results from a parallel mediation analysis indicated that NC was indirectly related to stress through its relationship with the Problem-focused coping. First, as can be seen in Table 2, NC was positively associated with problem-focused coping (a1 = 0.014; $p < 0.001$; 95%CI [0.006; 0.023]). Subsequently, higher problem-focused coping was related to less stress level (b1 = – 2.973; p = 0.006; 95%CI [-5.063; – 0.883]). A 95% percentile confidence interval based on 5,000 bootstrap samples indicated that the indirect effect through problem-focused coping of stress, holding all other mediators constant, was entirely below zero (a1b1 = – 0.041; boot95% CI [-0.087 to – 0.009]). Moreover, NC was also significantly positively linked with emotion-focused coping strategy (a2 = 0.013; p = 0.002; 95%CI [0.005; 0.021]), however this type of coping strategy was not associated with stress (b2 = 0.423; p = 0.702; 95%CI [-1.768; 2,613]. In contrast, avoidant-focused coping was positively associated with stress severity (b3 = 2.490; p = 0.040; 95%CI [0.113; 4.868]), while the relationship between NC and avoidant-focused coping was not significant (a3 = – 0.003; p = 0.474; 95%CI [-0.010; 0.005]). The indirect effects through both the emotion-focused and the avoidant-focused coping strategies of stress were not different than zero (boot95%CI: [-0.029; 0.035] and [-0.031; 0.014], respectively; see Table 2).

Moreover, connectedness to nature was not significantly associated with stress level when considering NC's indirect effect through all three coping strategies (c' = 0.001; p = 0.988; 95%CI [-0.074; 0.075]).

**Table 2.** The summary of parallel multiple mediation analysis for the indirect effects of coping strategies in the relationship between CNS and stress

| *X* | *M* | *Y* | Path | B (*SE*) | β | *t* test | *p*-value | 95% CI |
|---|---|---|---|---|---|---|---|---|
| CNS | PF | Stress | **$a_1$** | **0.014(0.004)** | **0.369** | **3.533** | **< .001** | **0.006; 0.022** |
| | EF | | **$a_2$** | **0.013(0.004)** | **0.347** | **3.283** | **= .002** | **0.005; 0.021** |
| | AF | | $a_3$ | -0.003(0.004) | -0.081 | -0.719 | = .474 | -0.009; 0.004 |
| (CNS) | PF | Stress | **$b_1$** | **-2.973 (1.049)** | **-0.343** | **-2.833** | **= .006** | **-5.063; – 0.833** |
| | EF | | $b_2$ | 0.423 (1.100) | 0.048 | 0.384 | = .704 | -1.768; 2.613 |
| | AF | | **$b_3$** | **2.490 (1.194)** | **0.236** | **2.086** | **= .040** | **0.113; 4.868** |
| CNS | (PF EF AF) | Stress | c' | 0.001 (0.037) | 0.002 | 0.015 | = .988 | -0.074; 0.075 |
| Total effect | | | c | -0.042 (0.036) | -0.127 | -1.140 | = .258 | -0.114; 0.031 |

| *X* | *M* | *Y* | Path | B (*SE*) | β | *t* test | *p*-value | 95% CI |
|---|---|---|---|---|---|---|---|---|
| | | | | Unstandardized effect | | Completely standardized effect | | |
| Indirect effect | | | | $B$ ($_{boot}SE$) | $_{boot}$95% CI | β (*SE*) | | $_{boot}$95% CI |
| CNS | PF | Stress | $\mathbf{a_1b_1}$ | **-0.041 (0.020)** | **-0.087; – 0.009** | **-0.127 (0.058)** | | **-0.254; – 0.029** |
| | EF | | $a_2b_2$ | 0.005 (0.015) | -0.029; 0.035 | 0.017 (0.047) | | -0.089; 0.106 |
| | AF | | $a_3b_3$ | -0.006 (0.011) | -0.031; 0.014 | -0.019 (0.034) | | -0.093; 0.045 |
| Total indirect effect | | | **ab** | **-0.042 (0.023)** | **-0.093; – 0.002** | **-0.129 (0.068)** | | **-0.274; – 0.005** |
| Model summary | | | | *R2* = 0.127; *R2adj* = 0.016, *F*(1, 79) = 1.300; *p* = 0.258 | | | | |

*Note.* CNS – connectedness to nature; PF – problem-focused coping strategy; EF – emotion-focused coping strategy; AF – avoidant-focused coping strategy; *X* – independent variable; *M* – mediator; *Y* – dependent variable

### Associations between NC and anxiety

The results of the parallel multiple mediation analysis can be seen in Table 2.

As it was reported above, connectedness to nature was significantly positively linked with problem-focused (see a1) and emotion-focused coping strategy (see a2). However, out of the three types of coping, only avoidant-focused strategy was significantly related to the anxiety severity (b3 = 2.931; p = 0.005; 95%CI [0.894; 4.967]). The results indicate that none of indirect effects of coping strategies on anxiety were significant (see Table 3). The direct effect of CNS on anxiety was also insignificant (c′ = – 0.041; p = 0.211; 95%CI [-0.104; 0.023]).

**Table 3.** The summary of parallel multiple mediation analysis for the indirect effects of coping strategies in the relationship between CNS and anxiety

| *X* | *M* | *Y* | Path | *B* (*SE*) | β | *t* test | *p*-value | 95% CI |
|---|---|---|---|---|---|---|---|---|
| CNS | PF | Anxiety | $\mathbf{a_1}$ | **0.014(0.004)** | **0.369** | **3.533** | **< .001** | **0.006; 0.022** |
| | EF | | $\mathbf{a_2}$ | **0.013(0.004)** | **0.347** | **3.283** | **= .002** | **0.005; 0.021** |
| | AF | | $a_3$ | -0.003(0.004) | -0.081 | -0.719 | = .474 | -0.009; 0.004 |
| (CNS) | PF | Anxiety | $b_1$ | -1.778 (0.899) | -0.234 | -1.978 | = .052 | -3.569; 0.013 |
| | EF | | $b_2$ | 0.780 (0.943) | 0.101 | 0.828 | = .411 | -1.097; 2.657 |
| | AF | | $\mathbf{b_3}$ | **2.931 (1.023)** | **0.317** | **2.865** | **= .005** | **0.894; 4.967** |
| CNS | (PF EF AF) | Anxiety | c’ | -0.040 (0.032) | -0.142 | -1.263 | = .211 | -0.104; 0.023 |
| Total effect | | | c | -0.063 (0.031) | -0.219 | -1.992 | = .050 | -0.125; 0.000 |
| | | | | Unstandardized effect | | Completely standardized effect | | |
| Indirect effect | | | | $B$ ($_{boot}SE$) | $_{boot}$95% CI | β (*SE*) | | $_{boot}$95% CI |
| CNS | PF | Anxiety | $a_1b_1$ | -0.025 (0.017) | -0.064; – 0.003 | -0.086 (0.056) | | -0.210; 0.009 |
| | EF | | $a_2b_2$ | 0.010 (0.014) | -0.014; 0.039 | 0.035 (0.047) | | -0.049; 0.137 |
| | AF | | $a_3b_3$ | -0.007 (0.012) | -0.035; 0.015 | -0.026 (0.042) | | -0.115; 0.055 |
| Total indirect effect | | | ab | -0.022 (0.023) | -0.071; 0.018 | -0.077 (0.075) | | -0.228; 0.066 |
| Model summary | | | | *R2* = 0.129; *R2adj* = 0.048, *F*(1, 79) = 3.966; *p* = 0.050 | | | | |

*Note.* CNS – connectedness to nature; PF – problem-focused coping strategy; EF – emotion-focused coping strategy; AF – avoidant-focused coping strategy; *X* – independent variable; *M* – mediator; *Y* – dependent variable

### Associations between NC and depression

The findings from a third parallel mediation analysis (Table 3) indicated that higher problem-focused coping was related to lower depression (b1 = – 2.999; p = 0.001; 95%CI [-4.746; – 1.253]). The indirect effect through problem-focused coping of depression, holding all other mediators constant, was significant (a1b1 = – 0.042; boot95%CI [-0.083; – 0.013]). Emotion-focused coping strategy was not associated with depression (b2 = – 1.358; p = 0.144; 95%CI [-3.189; 0.472]. In contrast, avoidant-focused coping was positively associated with depression severity (b3 = 3.788; p < 0.001; 95%CI [1.802; 5.774]). The indirect effects through both the emotion-focused and the avoidant-focused coping strategies of depression were not significant (a2b2 = – 0.017; boot95%CI: [-0.049; 0.007], and a3b3 = – 0.009; 95%CI [-0.042; 0.019]; see Table 4).

It was shown that NC was not significantly direct associated with depression (c' = – 0.012; p = 0.692; 95%CI [-0.075; 0.050]). Thus, NC was indirectly related to depression through its relationship with the Problem-focused coping.

**Table 4.** The summary of parallel multiple mediation analysis for the indirect effects of coping strategies in the relationship between CNS and depression

| *X* | *M* | *Y* | Path | B (*SE*) | β | *t* test | *p*-value | 95% CI |
|---|---|---|---|---|---|---|---|---|
| CNS | PF | Dep. | **$a_1$** | **0.014(0.004)** | **0.369** | **3.533** | **< .001** | **0.006; 0.022** |
| | EF | | **$a_2$** | **0.013(0.004)** | **0.347** | **3.283** | **= .002** | **0.005; 0.021** |
| | AF | | $a_3$ | -0.003(0.004) | -0.081 | -0.719 | = .474 | -0.009; 0.004 |
| (CNS) | PF | Dep. | $b_1$ | -2.999 (0.877) | -0.363 | -3.421 | = .001 | -4,746; – 1,253 |
| | EF | | $b_2$ | -1.358 (0.919) | -0.162 | -1.478 | = ,144 | -3,189; 0,472 |
| | AF | | **$b_3$** | **3.788 (0.997)** | **0.377** | **3.799** | **< .001** | **1,802; 5,774** |
| CNS | (PF EF AF) | Dep. | c' | -0.012 (0.031) | -0.040 | -0.398 | = .692 | -0.075; 0.050 |
| Total effect | | | **c** | **-0.081 (0.034)** | **-0.261** | **-2.403** | **= .019** | **-0.148; – 0.014** |
| | | | | Unstandardized effect | | Completely standardized effect | | |
| Indirect effect | | | | *B* ($_{boot}$*SE*) | $_{boot}$95% CI | β (*SE*) | $_{boot}$95% CI | |
| CNS | PF | Dep. | **$a_1b_1$** | **-0.042 (0.018)** | **-0.083; – 0.013** | **-0.134 (0.051)** | **-0.244; – 0.045** | |
| | EF | | $a_2b_2$ | -0.017 (0.014) | -0.049; 0.007 | -0.056 (0.046) | -0.162; 0.022 | |
| | AF | | $a_3b_3$ | -0.009 (0.015) | -0.042; 0.019 | -0.030 (0.047) | -0.126; 0.063 | |
| Total indirect effect | | | **ab** | **-0.069 (0.027)** | **-0.125; – 0.023** | **-0.221 (0.074)** | **-0.368; – 0.080** | |
| Model summary | | | | *R2* = 0.129; *R2adj* = 0.048, *F*(1, 79) = 3.966; *p* = 0.050 | | | | |

*Note.* CNS – connectedness to nature; PF – problem-focused coping strategy; EF – emotion-focused coping strategy; AF – avoidant-focused coping strategy; Dep. – depression; *X* – independent variable; *M* – mediator; *Y* – dependent variable

## DISCUSSION

Polish authors more and more often are focused on relations between nature and human mental health. In particular, the nature-based interventions, such as therapeutic birdwatching [34, 35], therapeutic mountain hiking [36] or forest bathing [37, 38] are known to broader group of readers. Nevertheless, until now Polish works have not focused neither on developing psychological mechanisms nor the hypotheses about relationships between variables. Worldwide studies indicated several mechanisms of interrelation between nature and mental health, focused mostly on stress reduction, realization of psychological unalienable needs, based on biophilia hypothesis and evolutionary aspects of adaptation to natural environments.

Furthermore, the latest scientifical reports focus on neuropsychological mechanisms e.g. decreasing in amygdala activity or neural activity in the subgenual prefrontal cortex [39-40]. More and more attention has been paid by researcher to human ecology or ecosystem service perspective [41-43], as contact with nature seems to be one of the most important environmental factors of mental health as well [44].

The aim of present study was to broaden the current understanding of the associations between nature connectedness and mental health in terms of psychopathological symptoms of anxiety, depression, and stress. In this study, a theoretical model of mediating role of coping strategies was developed. The aim was to test the mediating effect of coping strategies in the associations between nature connectedness and mental well-being. The developed model demonstrated adequate fit to the data.

Overall, our results showed that there was a significant positive association between the nature connectedness and both problem-focused and emotion-focused coping strategy, but not avoidant-focused coping strategy. In more detail in accordance to examined group, the results indicated that (1) NC was indirectly related to stress through its relationship with the Problem-focused coping; 2) NC was neither directly nor indirectly associated with anxiety symptoms; 3) NC was indirectly related to depression through its relationship with the Problem-focused coping.

The mediation analysis indicated that the effect of connectedness to nature on stress and depression is mediated via problem-focused coping strategy. Specifically, our final model showed that the path of connectedness to nature – problem focus coping – depression/ stress was significant, showing that people with higher levels of connectedness to nature are prone to produce less sense of depression and stress. This result suggests far-reaching health benefits of nature connectedness.

Since the links between connectedness to nature, coping, and well-being are complex and there is no other research into the phenomenon, future research may focus on testing hypothetical models, as well as individual and group differences.

Presented findings show that strengthening connectedness to nature contributes significantly to well-being and may be an important target of stress reduction programs and effectively add to the promotion of public mental health.

### Strengths and limitations

This study was, to the best of author's knowledge, among the first to test the links between nature connectedness and mental health in relation to coping strategies as mediators. Moreover, presented results offer novel insights regarding their importance. Furthermore, different coping strategies were tested considering three main areas of mental wellbeing: stress, anxiety and depression.

In addition to the study strengths, the research has several limitations. One of the main ones is its cross-sectional nature, which did not let us understand the causal directions of the associations. Reliance on a small, relatively young sample makes generalizing the results to other populations impossible, moreover, the sample size may have been insufficient to detect small effects. Therefore, if future research on bigger groups replicated current results, stronger inferences could be made.

### Recommendations for future research and clinical practice

The current study offers several promising that would benefit from replication and extension. Future research may incorporate more variables into the model. Clinical practice may benefit from examining the role of nature connectedness in the development of and the recovery from diagnosed mental disorders. Although more extensive research is needed, policy and public health interventions should focus on incorporating those, which should increase nature connectedness to bolster psychological well-being with little financial outlay.

Future research should include research questions regarding which particular form of contact with nature is beneficial to health, as well as what kind of interventions strengthen the connection to nature and therefore via coping styles changes individual's wellbeing [45-46].

## CONCLUSION

The current study shows that nature connectedness mediated by coping strategies may function similar to the other psychological resources such as optimism, personal control, and a sense of meaning. As such, nature connectedness seems to be a mental health protective factor in times of various, complex crises.

***Declarations***
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***Availability of data and material:*** *The raw data supporting the conclusions of this article will be made available by the author, without undue reservation.*
***Code availability:*** *not applicable*
***Authors' contributions:*** *not applicable*
***Ethics approval:*** *This study involving human participants was reviewed and approved by the Maria Grzegorzewska University of Ethics Committee (No 44/2021). The procedures used in this study adhere to the tenets of the Declaration of Helsinki.*
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