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# The Role of Emotion Crafting in the Relation between Physical Activity and Resilience

Bachelor's thesis in Psychology  
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## Preface

This bachelor thesis marks the end of my three-year bachelor program in psychology at NTNU, Trondheim. I was drawn to the topic of emotion crafting because of its positive approach to the topic of emotions. With experience in promoting mental health, I was thrilled to explore positive and optimistic aspects of psychology, as I firmly believe this approach is superior in many cases. Discovering that I could also write about physical activity, a major contributor to my own well-being, made me very satisfied with my choice.

The conceptualization, literature review, and writing of this thesis were undertaken independently. However, during this process I received priceless guidance from my supervisor, Jolene van der Kaap-Deeder. Her assistance not only enhanced the quality of my work through feedback on my writing, but also provided me with a profound understanding of the topics at hand and the research process in general. Additionally, I would like to extend my appreciation to my fellow students in the group. Being able to both ask and answer questions in such a supportive environment has increased the confidence in my work. Also, data collection was done as a group, and would not have been possible without the contribution of each member. Lastly, I owe much of the credit for this thesis to my family, friends and boyfriend. Writing the thesis while dealing with burnout has been anything but easy. The fact that I was able to produce a result I am proud of is completely dependent on the support I have received from people close to me during this time.

## Abstract

The relation between physical activity and resilience is well-established in psychological literature, but the mechanisms underpinning this association remain only partially understood. The present study aimed to add to the current knowledge by examining the role of emotion crafting between physical activity and resilience. Data were collected from a total of 162 participants (71% female;  $M_{age} = 22.23$  years,  $SD = 1.91$ ; range 18-25) who completed an online survey that measured the way in which people search to increase daily positive feelings through emotion crafting and related concepts. Surprisingly, results yielded that physical activity and resilience were unrelated. Likewise, no link was found between physical activity and emotion crafting. However, emotion crafting showed a significant association with resilience. First, these findings extend the knowledge on the new concept of emotion crafting, suggesting that the active cultivation of positive emotions might be important in relation to resilience. Second, as the missing link between physical activity and resilience of the current study contradicts existing literature, it should work as a catalyst for further replication attempts.

*Keywords: physical activity, emotion crafting, positive emotions, resilience*

Young adulthood is a time marked by the continuous presence of stressors, both intrapersonal and in the physical environment. Psychological resilience (i.e. an individual's ability to bounce back from negative emotional experiences and return to one's characteristic state; Block & Kremen, 1996), is a capability of protective power. Individuals possessing higher levels of resilience are in a better position to face, overcome and even grow from the challenges of young adulthood. Given the magnitude of the stressors in this period of life, the promotion of resilience merits greater attention. Emerging evidence suggest physical activity is positively associated with resilience (Bernstein & McNally, 2018). Less is known about the mechanisms involved in this relation, but it has been suggested that exercise initiates a process that changes the way emotions are processed (Bernstein & McNally, 2018). To enhance knowledge on this association, the current study seeks to explore the relation between physical activity and resilience, and whether emotion crafting mediates this link.

## **Resilience**

Psychological resilience has been described as an individual's ability to bounce back from negative emotional experiences and return to one's characteristic state (Block & Kremen, 1996), as well as adapt in a flexible manner to the changing demands of stressful experiences (Lazarus, 1993). On the broader level of factors associated with resilience, a meta-analytic explorative review found protective factors (e.g., self-efficacy) to have the largest effect size in relation to resilience, followed by risk factors (e.g., depressive symptoms) and demographic factors (e.g., age; Lee et al., 2013). The strongest correlation to positive factors could be partly explained by the fact that resilience itself is considered a positive factor, but is regardless important and informative in indicating that a focus on enhancing protective factors might be a more effective strategy in enhancing resilience than to reduce risk factors.

Resilience interrelates with the concept of stress, as it involves flexible adaptation to stressful experiences (Lazarus, 1993). Broadly, stress is the set of responses to a perceived threat, demand or challenge (Liu et al., 2019). Short-term, these acute stress responses can serve an adaptive function, preparing the body with energy and needed resources. However, constant activation will tear and affect the body negatively long-term, placing the individual at risk for numerous unwanted outcomes (Liu et al., 2019). Stressor management, both at the societal level (e.g., lack of institutional resources, diseases, war) and the individual level (e.g., job stress, perceived pressure, family issues), reflects individual well-being and health (Liu et al., 2019). While young, healthy individuals generally adapt well to acute stressors and can even benefit from managing chronic stress healthily (Liu et al., 2019), stress also highlights individual differences, showing there are multiple ways of perceiving and responding to the same circumstances. Specifically, the literature suggests that resilience influences the stress process at multiple stages, most in the manner of appraisal of the stressors, the meta-cognitions in response to the emotions that arise, and in the choice of coping strategies (Fletcher & Sarkar, 2013).

Resilience then, could contribute to explaining why some individuals cope with traumatic injuries in a more successful way than others (Lee et al., 2013). Individuals possessing higher levels of resilience show accelerated cardiovascular recovery from negative emotional arousals and find positive meaning in negative circumstances (Tugade & Fredrickson, 2004). Further, resilience has been linked to greater emotional intelligence (Schneider et al., 2013), decreased depression (Southwick et al., 2005) and high positive emotionality (Block & Kremen, 1996).

### **Physical Activity and Resilience**

Many conceptualizations of resilience imply a generalized and characteristic trait of an individual, rather than a changing, situation-specific response (Block & Kremen, 1996).

However, this view fails to account for the notion that adaptation stems from the interplay between the individual and its environment (Lee et al., 2013). This incorporates an understanding of resilience as a dynamic process, opening the possibility for change and development. Masten (2001) argues that resilience needs to be viewed as something ordinary rather than extraordinary, offering a positive outlook on resilience as something achievable for most people. This is a perspective in line with findings that different factors affect the development of resilience, one of these factors being physical activity (Bernstein & McNally, 2018).

The World Health Organization defines physical activity (PA) as “any bodily movement produced by skeletal muscles that requires energy expenditure” (WHO, 2022). This includes all movement, including transportation and work. Further, both moderate and vigorous intensity PA is found to improve health (WHO, 2022), while vigorous PA is found to show a stronger relation to resilience than moderate (Dunston et al., 2020). Physical inactivity is viewed as one of the major global health risks the human population currently face (Bull et al., 2021). However, despite the well-known risks, as much as one quarter of adults and three quarters of adolescents are not adequately active (Bull et al., 2021). On the other hand, the list of benefits of PA is comprehensive and extends over several areas of life. Examples are improved sleep quality, cognitive function, improved measures of adiposity, and decreased risk of stroke, cardiovascular disease and symptoms of anxiety and depression (Bull et al., 2021). Indeed, research has estimated that 12% of new depression cases could be prevented if everyone engaged in a minimum of one hour of exercise per week (Harvey et al., 2017). Furthermore, PA has been linked to improved quality of life and increased well-being (Marquez et al., 2020).

Emerging evidence suggests that PA is also linked to psychological resilience (Belcher et al., 2021; Bernstein & McNally, 2018; Salmon, 2001; Xu et al., 2021; Zhang et al., 2022).

Directly illustrating this link, physically fit individuals return more quickly to their baseline psychological state following a stressor than their non-fit peers, exercise enhance the physiological ability to handle stress, and physical active people are more resilient to the effects of rumination and cortisol reactivity than less active individuals (Puterman et al., 2011; Bernstein & McNally, 2018). It even appears that single sessions of exercise have these effects when faced with stress (Bernstein & McNally, 2018). Research also provides indirect evidence for the importance of PA in resilience. Experimental and observational research suggests that exercise changes how individuals respond to emotions, including both experimentally- and naturally induced emotions (Bernstein & McNally, 2018). Furthermore, this is through facilitating emotional recovery, rather than preventing or blunting initial negative emotional responses (Bernstein & McNally, 2018; Bernstein et al., 2019). Research seems to indicate that PA initiates a process that alters the way individuals process and respond to emotions, rather than through simply elevating mood (Bernstein & McNally, 2018). PA then, might alter emotion regulation, especially the regulation of negative emotions. This is illustrated by the fact that active individuals do not necessarily have less frequent or intense negative emotions, but that they show a greater ability to regulate and recover from them when they arise (Bernstein et al., 2019). Such findings indicate some psychological process mediating this link between PA and resilience, but the exact mechanisms underpinning this association remain unclear.

### **The Mediating Role of Emotion Crafting**

Cultivating positive emotions is important for promoting resilience (Tugade & Fredrickson, 2007). However, perceiving threats in negative circumstances has vital adaptive advantages (Tugade & Fredrickson, 2004), as this stress has contributed to the survival of the human race. The negative appraisal style that lasts over time is what is less beneficial and



hinders resilience. As noted, it is not a fact that resilient individuals do not perceive threats and experience negative emotions, rather the opposite seems to be true. Resilient individuals appear to experience high levels of anxiety and frustration amidst stressful times, but in addition simultaneously experience positive emotions (Tugade & Fredrickson, 2004). Hence, positive emotions are the factor that distinguishes resilient and non-resilient individuals in times of stress (Tugade & Fredrickson, 2004).

Emotion crafting (EC) is the ability to recognize contexts evoking positive emotions, and consequently proactively pursuing positive emotions through actions (Van der Kaap-Deeder et al., 2023). The concept contributes greatly to the current literature in the manner that studies so far mainly have focused on the more passive regulation of negative emotion, in the field of emotion regulation. The need to focus on positive emotions is illustrated through the human tendency to wish and seek an increase in positive emotions, as well as a decrease of negative, approximately 70% to 92% of the time (Gross et al., 2006). Further, research suggests no full overlap between EC and strategies to regulate negative emotions, which highlights the importance of studying them as separate constructs, avoiding transferring knowledge about one on to the other (Van der Kaap-Deeder et al., 2023).

EC builds upon theories of agency such as the Self-Determination Theory (SDT; Ryan & Deci, 2000). This agentic view posits that people share a need to be the author of their own lives, proactively and autonomously shaping their circumstances. SDTs account of emotion regulation highlight the importance of open awareness of one's emotional states (Benita, 2020). Such awareness enables the individual to engage in action. This notion is applied specifically to positive emotions in EC; noticing opportunities for initiating, maintaining or increasing positive emotions (i.e., awareness component), and followingly engaging in action to do so (i.e., action

component; Van der Kaap-Deeder et al., 2023). Awareness is then a prerequisite for action, where only the latter has shown a relation to positive outcomes such as higher levels of well-being (Van der Kaap-Deeder et al., 2023).

The concept of well-being, a cornerstone of human functioning, is one way to illustrate the significance of positive emotions. The hedonic well-being of positive affect is the short-term benefit of such emotional states (Tugade & Fredrickson, 2007). However, more important is the fact that hedonic well-being can lead to increased eudaimonic well-being, conceptualized as long-term activities that can generate personal growth, positive relationships with other people and sense of mastery (Tugade & Fredrickson, 2007). Further, positive affect is linked to several other beneficial outcomes. For instance it can work as a buffer against the psychological consequences of stress, as this affective state is found to often occur simultaneously as negative affect in stressful times (Folkman & Moskowitz, 2000). This points in the direction of adaptational benefits of positive emotions, which is important as the previous focus has been mostly based on the adaptive benefits of negative emotional states. People experiencing regular positive affect are also found to experience more success and flourishing in life (Lyubomirsky et al., 2005). Most relevant is the fact that the *active* cultivation of positive emotions is an important contributor in developing resilience (Tugade & Fredrickson, 2007).

The Broaden-and-Build Theory provides a framework for understanding the relation between positive emotions and resilience (Fredrickson, 1998, 2001). The theory makes the bold prediction that positive emotions might not only reflect resilience, but also contribute to the development of it (Fredrickson, 2001). Experiencing positive emotions broadens the momentary thought-action repertoire of the individual, leading to the accumulation of personal resources. As noted, resilient individuals often find positive meaning in negative circumstances (Tugade &

Fredrickson, 2004). This illustrates a reciprocal relationship between the two concepts. Positive emotions broaden thinking, increasing the likelihood of finding positive meaning in challenging situations. In turn, finding positive meaning triggers positive emotions. Over time, this cycle of positive emotions, broadened thinking, and positive meaning can compound, ultimately enhancing well-being and building resilience (Fredrickson, 2001).

## **The Present Study**

Previous research has found that individuals with a tendency of scoring higher on psychological resilience tend to be more physically active as well, and that positive emotions are a useful tool in achieving this outcome (Bernstein & McNally, 2018; Tugade & Fredrickson, 2004). Bernstein and McNally (2018, p. 29) highlight a gap in the literature, noting that “it remains unclear what psychological processes are altered by exercise that enhance resilience”, meaning future research should focus on the possible mechanisms in the relation between PA and resilience. Hence, the aim of this study was to examine the possible mediating role of EC in the relation between PA and resilience. In the present study, it was first expected that PA relates positively to resilience (Hypothesis 1). Second, to explain this relation, it was expected that PA relates via more EC to resilience (Hypothesis 2).

## **Method**

### **Sample**

A total of 162 young adults, between the ages of 18 to 25 ( $M_{age} = 22.23$  years,  $SD = 1.91$ ) participated in the current study. This resulted in a final sample of 116 women (71.6%) and 41 men (25.3%), while 4 were non-binary (2.5%) and 1 did not want to disclose (0.6%). While a few participants had not completed high-school (3.7%), most had this as the highest reached education level (56.2%). Some had also completed education higher than this, hereunder

vocational training (6.8%), bachelor's degree (22.8%) or master's degree (8.0%). However, the majority were currently students (77.8%). Most were from Norway (95.1%), had a job (72.8%) and were single (56.8%).

## **Procedure**

The data collection took place in February and March of 2023, as part of a bachelor project on emotion crafting. Seven people recruited participants through convenience and snowball sampling. Social networks and social media were used for recruitment, where individuals were asked to participate in a project on how to increase one's daily positive feelings. The online questionnaire was filled out using the survey tool Nettskjema, where all responses were anonymous. Consent was obtained on the first page of the questionnaire, where additional information about the research project was presented. Questionnaires that were not available in Norwegian were translated in accordance with the guidelines of the International Test Commission (ITC; International Test Commission, 2017). The processing of the personal data of the participants was approved by the Norwegian Agency for Shared Services in Education and Research (Sikt) in January of 2023.

## **Instruments**

### ***Physical Activity***

The International Physical Activity Questionnaire short form (IPAQ-SF; Brown et al. 2004; Hallal & Victora, 2004) was used to assess PA levels. The IPAQ-SF measures three specific types of activity: walking, moderate-intensity activities, and vigorous-intensity activities. Participants were asked to recall activities done in the past week. The scale has two items for each activity type, assessing the frequency (e.g., "During the last 7 days, on how many days did you do vigorous PA like heavy lifting, digging, aerobics, or fast bicycling?") and duration (e.g.,

“How much time did you usually spend doing vigorous PA on one of those days?”). IPAQ-SF provides a total score of PA MET-minutes per week through adding together the MET-minutes for each activity. The individual metabolic equivalent of task (MET) minutes are calculated through multiplying frequency, duration and respectively the numbers of 3.3 (walking), 4.0 (moderate-intensity activities) and 8.0 (vigorous-intensity activities). These MET values are measures of energy expenditure for the specific activities, defined as the proportion of work-related metabolic rate compared to a standard resting metabolic rate (Ainsworth et al., 2000). Values of the different activities are based on the Ainsworth et al. compendium (Ainsworth et al., 2000). To illustrate, a MET value of 3.3 means walking exerts over three times the energy one would if sitting still. The IPAQ-SF has shown high reliability in previous studies, and is considered an appropriate measure to assess participation in PA within the population (Brown et al., 2004; Hallal & Victora, 2004).

### ***Emotion Crafting***

EC was measured using the Emotion Crafting Scale (ECS; Van der Kaap-Deeder et al., 2021). The ECS assesses the awareness and action components of EC through four items for awareness (e.g., “I am aware of which activities make me feel good”) and eight items for action (e.g., “I seek out situations which make me feel good”). For the 12 items, participants were asked to indicate their level of agreement with each statement on a 5-point Likert-scale, ranging from 1 = *strongly disagree* to 5 = *strongly agree*. The scores on the items were averaged, providing an overall mean score of EC. A recent study has applied the ECS to another Norwegian sample, and found evidence for the internal structure and validity of the ECS (Van der Kaap-Deeder et al., 2023). In the current study, the scale showed a good Cronbach’s alpha of .82

## ***Resilience***

The Brief Resilience Scale (BRS; Smith et al., 2008; Chimitorz et al., 2013) was used to measure psychological resilience. The BRS consists of six items, three of which need to be reverse coded as they are negatively worded (e.g., “I have a hard time making it through stressful events”), while three are positively worded (e.g., “I tend to bounce back quickly after hard times”). Participants were asked to indicate the extent of agreement to the statements through a 5-point Likert scale, ranging from 1 = *strongly disagree* to 5 = *strongly agree*. The scale has been found to show one of the best psychometric properties in a review of different resilience scales (Windle et al., 2011). The reliability in the current study was found to be excellent, with a Cronbach’s alpha of .90.

## **Statistical Analyses**

All analyses were performed in IBM SPSS Statistics (Version 28). First, preliminary analyses were used to examine reliability, as well as the relations between the background variables (i.e., gender, origin, job, student, marital status, age and educational level) and study variables (i.e., PA, EC and resilience). To assess reliability, Cronbach’s alpha was apprehended for the study variables. Subsequently, a descriptive and correlational analysis was conducted to investigate the associations between them. A MANOVA was further ran to check possible relations between the study variables and background characteristics. For the primary analyses, PROCESS mediation was used to test for 1) the relation between PA and resilience, and 2) the mediating role of EC between these variables, while controlling for gender and job. Here, PA is the independent variable (X), while resilience is the dependent or outcome variable (Y), and EC the mediator (M).

## Results

### Preliminary Analyses

First, data were prepared for analyses, hereby recoding some of the background variables as some categories of these variables contained too few participants. Gender was recoded from four to two categories (male and female, removing values of those who indicated non-binary and not wanting to disclose). Additionally, marital status was recoded from five to two categories (single and partner, recoding widowed, divorced/separated and single with never having been married into the single variable, and having a partner both with and without marriage into the partner variable). The category “other” of educational level was removed as to be able to use this variable in a continuous manner (with higher levels indicating more years of education). Finally, as participants’ origin was assessed through an open question, their responses were recoded into two categories (Norwegian and other). Descriptive statistics and bivariate correlations between the study variables are presented in Table 1. A small significant and positive correlation was found between EC and resilience, which was the only significant relation between the three study variables.

**Table 1**

*Descriptive Statistics of and Bivariate Correlations Between the Study Variables (N = 162)*

Variables	<i>M</i>	<i>SD</i>	1.	2.
1. PA	3390.39	2608.13	-	
2. EC	4.13	0.50	.11	-
3. Resilience	3.38	0.88	.11	.23**

*Note.* PA = physical activity, EC = emotion crafting.

\*\*  $p < .01$ .

A multivariate analysis of covariance (MANCOVA) was used to examine the relations from the background variables of gender, origin, job, student and marital status (fixed factors) and age and education level (covariates) to the dependent variables (i.e., EC and resilience). Gender related significantly to the study variables,  $F(2, 147) = 4.12, p = .018$ , Wilks'  $\Lambda = .95$ , partial  $\eta^2 = .05$ , where males ( $M = 3.55; SD = 0.21$ ) scored higher on resilience than females ( $M = 3.18; SD = 0.18$ );  $F(1, 148) = 4.81, p = .030$ . The same applies to having a job,  $F(4, 294) = 2.70, p = .031$ , Wilks'  $\Lambda = .93$ , partial  $\eta^2 = .04$ , where resilience scores were significantly higher for participants working full-time ( $M = 3.48; SD = 0.25$ ) or part-time ( $M = 3.53; SD = 0.19$ ) than for those without a job ( $M = 3.08, SD = 0.24$ ),  $F(2, 148) = 3.15, p = .046$ . Based on these analyses, the background variables gender and job will be controlled for in all following analyses.

### **Primary Analyses**

The mediation analysis was performed using PROCESS Model 4. Results are shown in Table 2 and illustrated visually in Figure 1. EC and resilience showed a positive and significant relation, when controlled for the effects of gender and having a job. No significant effect was found between PA and EC, or between PA and resilience directly or indirectly<sup>1</sup>.

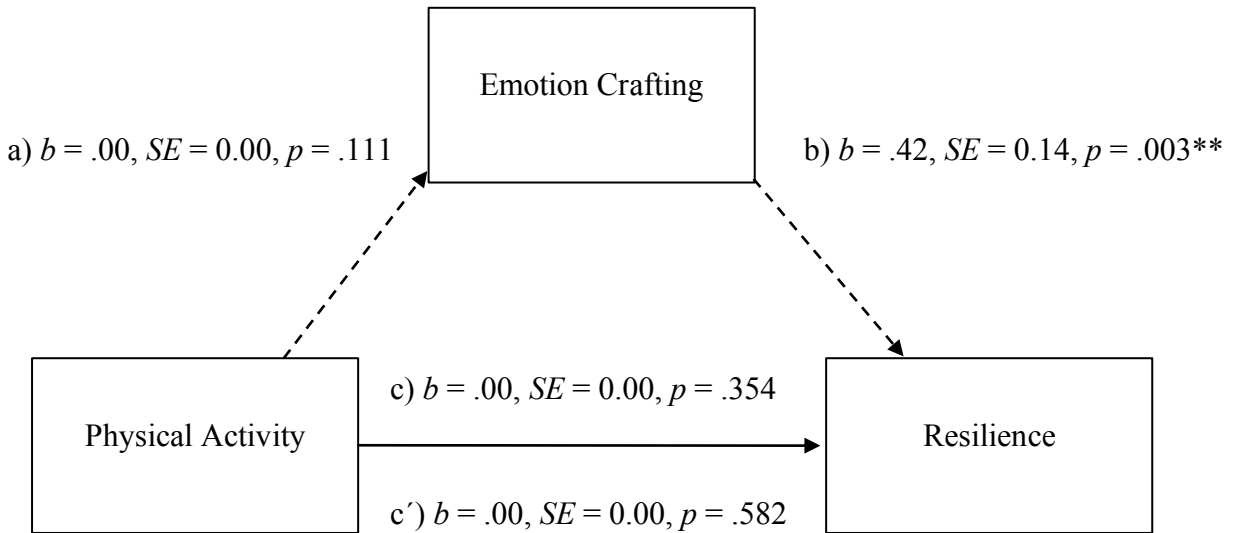
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<sup>1</sup> PA was subsequently split into vigorous and moderate to investigate whether this would produce different results. Neither vigorous nor moderate PA was significantly related to resilience or EC.



**Figure 1**

*The Mediating Role of Emotion Crafting in the Relation between Physical Activity and Resilience*



*Note.* Unstandardized coefficients are displayed with corresponding standard errors and  $p$ -values.

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

**Table 2***The Mediating Role of Emotion Crafting Between Physical Activity and Resilience (N = 157)*

Outcome	c-path		c'-path		a-path		b-path		a*b	
	<i>b (SE)</i>	95% CI	<i>b (SE)</i>	95% CI	<i>b (SE)</i>	95% CI	<i>b (SE)</i>	95% CI	<i>b (SE)</i>	95% CI
Resilience	.00 (0.00)	0.00, 0.00	.00 (0.00)	0.00, 0.00	.00 (0.00)	0.00, 0.00	.42 (0.14)**	0.15, 0.68	.00 (0.00)	0.00, 0.00

*Note.* CI = confidence interval. Coefficients shown are unstandardized path coefficients (*b*) with standard errors (*SE*) reported between brackets. The a-path is the relation between physical activity and emotion crafting; the b-path is the relation between emotion crafting and resilience; the c-path is the initial relation between physical activity and resilience; the c'-path is the relation between physical activity and resilience while emotion crafting is considered; and a\*b is the indirect effect of PA on resilience through EC.

\*\*  $p < .01$ .

## Discussion

The aim of the current study was to investigate whether a link can be established between PA and resilience, and explore EC as a potential mediator in this relation. Previous research has found that regular exercise is related to greater resilience, making physically active individuals more robust when facing stress (Bernstein & McNally, 2018). It has been suggested that this is because exercise initiates a process that changes the way individuals process emotions (Bernstein & McNally, 2018), but little is known about the specific components of this. The current study henceforth sought to extend the knowledge on this process, and this way contribute to filling a gap in the literature. Only one significant relation was found between the study variables, with EC being positively associated with resilience.

Although it was hypothesized that PA would positively relate to resilience, this relation was found to be non-significant. This is surprising, as the relation is a relatively established link in psychological literature (Belcher et al., 2021; Bernstein & McNally, 2018; Salmon, 2001; Xu et al., 2021; Zhang et al., 2022). Certain previous findings indicate that intensity of physical activity plays a crucial role in the development of resilience, suggesting that moderate PA might not be as good as vigorous PA in relation to resilience (Dunston et al., 2022). Therefore, additional analyses were performed to see whether splitting these intensities would affect the results (see Footnote 1). However, this did not have any impact on the findings in the current study. Despite the lack of support for the first hypothesis, one should be cautious to interpret this as evidence against the PA and resilience link. The IPAQ measure is a possible source of error that could help explain the missing effect (Lee et al., 2011). Nevertheless, previous studies using the same measure show a significant relation (e.g., Xu et al., 2021).

In line with the non-significant relation between PA and resilience, PA did not relate to EC. As there was strong reason to expect significance of the first hypothesis (e.g., Salmon,

2001), there is a significant likelihood that the missing effect between PA and EC could be influenced by weaknesses of the IPAQ. However, a possible conceptual explanation for the nonsignificant relation between PA and EC concerns valence. PA has consistently been found to relate to positive affect (Reed & Buck, 2009), but this does not necessarily correspond to the regulation of positive affect. Rather, previous research supports that PA is more related to the regulation of negative affect, showing that active individuals report greater perceived ability to cope with stressors or negative mood (Bernstein & McNally, 2018). This is further supported by the growing consensus of exercise as an effective treatment for depression (Kvam et al., 2016), a disorder clearly marked by increased negative affect, evidently together with decreased positive. Such reasoning is in line with previous research indicating that exercise may not alter the propensity for rumination (i.e., repetitive, passive, self-focused thinking about one's experience), but rather reduce its duration, intensity or effects (Bernstein & McNally, 2018). This is a potential reason for the lacking relation, as EC is meaningfully differentiated from the regulation of negative emotions (Van der Kaap-Deeder et al., 2023), while this might be what PA mainly targets.

As the literature connecting PA level to resilience using the IPAQ is vast, this implies conceptual explanations for the unexpected findings of the missing links between PA, EC and resilience. SDT posits that an individual's ability to autonomously regulate their behavior, even under stress, is associated with resilience (Ryan & Deci, 2000; Vanteenkiste & Ryan, 2013). Additionally, EC applies this agentic approach through the proactive crafting of positive emotions (Van der Kaap-Deeder et al., 2023). It might be then, that the engagement in PA in the examined population is less driven by a sense of agency and autonomous motivation. Instead, involvement could have been influenced by external factors, such as social pressure or extrinsic rewards, which do not align with the principles of SDT to the same extent. This line of reasoning is consistent with findings showing that the stress-

buffering effect of PA is dependent on intrinsic motivation (Meyer et al., 2021), which represents the most autonomous form of motivational regulation (Ryan & Deci, 2000). Moreover, evidence indicates that individuals with higher extroversion and lower neuroticism are more likely to engage in exercise, as they tend to exhibit greater intrinsic motivation (Clark & Schroth, 2010). Hence, the potential absence of agency or autonomous motivation in PA could subsequently affect the relation between PA and both EC and resilience.

Results showed a significant relation between EC and resilience. Hence, being aware of opportunities that could initiate, maintain or increase positive feeling, and acting upon this awareness is related to the ability to bounce back from negative events more effectively. This is in line with previous findings showing that the cultivation of positive emotions is important for promoting resilience (Fredrickson, 2001; Tugade & Fredrickson, 2007). Resilient individuals have been found to experience positive emotions specifically in times of stress (Tugade & Fredrickson, 2004). The broaden-and-build theory posits that positive emotions broaden thought-action repertoires and enhance coping-resources (Tugade & Fredrickson, 2004). Experiencing positive emotions during or after a stressful event may then help individuals shift their perspective, reframe the situation, and discover new ways to cope with challenges. It has been suggested that the reciprocal relations between positive emotions, broadened thinking and finding positive meaning in negative circumstances accumulate and compound (Fredrickson, 2001). In the same manner downward spirals of depressed mood and the narrowed, pessimistic thinking has been linked to worsened mood and even clinical depression (Peterson & Seligman, 1984), the broaden-and-build theory predicts a comparable upward spiral (Fredrickson, 2001). As the mechanisms underlying the spiraling effects of positive emotions have not been fully established, EC serves as a possible contributing explanation to understanding the relation between positive emotions and resilience.

## **Strengths and Limitations**

This study had several important strengths and limitations. First, the online and anonymous aspect in combination with the fact that the survey was open for everyone in the relevant age group was a great strength. The survey was calculated to take approximately 30 minutes to answer with no reward for participation, which likely resulted in a smaller sample. However, this ensures a sample of motivated participants where most answered seriously and thoroughly. Also, two well-validated measurements have been used in the current study. The BRS has scored well in terms of both validity and reliability (Smith et al., 2008; Chimitorz et al., 2013). Given that the EC Scale (ECS) is a recent construct, its measurement properties have not been extensively examined. Nevertheless, empirical investigation has demonstrated high levels of reliability and validity (Van der Kaap-Deeder et al., 2023).

In terms of limitations, the study had a cross-sectional design. Obtaining all measures at the same time means causality and long-term effects cannot be determined. Also, the snapshot is not necessarily representative of participants' general level of PA, EC and resilience (Schooler & Schreiber, 2004). While self-report relies on the assumption that participants' subjective experiences can be measured through declarative knowledge, they are undoubtedly subject to errors such as inability or lacking motivation to comply to survey demands. When participants are meta-conscious (i.e., the awareness of own thought processes and understanding of underlying patterns; Schooler & Schreiber, 2004), one is only certain of what they believe they experience, and not the actual subjective experience itself. This is further complicated by the fact that PA, EC and resilience are considered socially desirable concepts, which increases the chance of social desirability bias (i.e., answering in a fashion that is viewed favorably by others). Alongside biases, memory is a potential additional factor of influence. Especially the IPAQ relies on memorizing the past week, which could be

especially difficult for the more mindless everyday activities such as walking (Lee et al., 2011).

This PA measure is an important potential limitation in itself, as systematic evidence suggests that certain precautions should be considered when using the IPAQ-SF (Lee et al., 2011). Most prominent, the measure has been found to overestimate PA level with an average of 84% when compared to objective standards of PA (Lee et al., 2011). Another important limitation is the restricted assessment of intensity. PA level is measured with frequency, duration and intensity. While frequency and duration are straightforward constructs (though with the risk of incorrect memory), the questionnaire does not provide a detailed assessment of intensity. Expecting all participants to interpret “vigorous” and “moderate” the exact same way is close to naïve, especially when also considering that the terms were translated into Norwegian which often lacks equivalents to the English words. Hence, this subjective nature of intensity assessment can lead to variability in responses and may not accurately reflect the true intensity of the activity.

Especially because of the missing effect, the sample of the current study is of interest. As convenience and snowball sampling was utilized, the findings run the risk of volunteer bias (i.e., participants are characteristically different from those not willing to participate) and selection bias (i.e., recruiting people characteristically different from those not asked). Consequently, this could create a biased sample with certain specific characteristics. A point of critique is the narrowness of demographic characteristics in the sample. Specifically, the majority was female, Norwegian students. It is possible that these or other characteristics affect the relation between PA and the other study variables. For example, as noted previous findings suggest PA work as a stress-buffer only when intrinsic motivation is high (Meyer et al., 2021). Significant gender-differences have been found in intrinsic motivation for PA among college students, males scoring higher (Durán-Vinagre et al., 2023; Lauderdale et al.,

2015). As females make up the majority of the sample in this study, this could be a factor of influence.

### **Implications for Practice, Theory and Future Research**

Despite the lack of significant relations in the current study, there are several directions that future research could take to deepen the understanding of this complex interplay. There is general consensus that PA is related to resilience (Belcher et al., 2021; Bernstein & McNally, 2018; Salmon, 2001; Xu et al., 2021; Zhang et al., 2022). Consequently, the present study's lack of significant findings raises the question whether previous studies or the current are flawed. Although existing literature heavily favors the existence of a positive association between the constructs, psychological research is not immune to publication bias and instances of unsuccessful replication. Notably, prior research has demonstrated a low replicability rate of only 39% for psychological studies across multiple domains (Open Science Collaboration, 2015). Therefore, the present study's non-significant findings should not be undermined but rather serve as a catalyst for additional replication attempts to understand the interplay between PA, resilience, and EC.

Replication attempts should especially focus on limiting the latent limitations of the IPAQ-SF. Because the IPAQ-SF measures PA the previous week, a normally active and fit individual could have a non-characteristic unactive week, and vice versa. Additionally, as previously noted, the IPAQ-SF has been found to exhibit a tendency to overestimate an individual's PA level (Lee et al., 2011). Future research should therefore consider using objective measuring devices (e.g., accelerometers, pedometers) to measure PA over a longer period of time.

Future research should also aim to broaden the scope of investigation by targeting a wider range of populations. The present study, with its limited and homogenous sample, acknowledged this as a potential limitation. Given that the largest group in this study



comprised of female Norwegian students, caution should be taken. It is possible that the sample's level of physical activity may not be representative of other groups, which may limit the ability to make direct comparisons. Thus, it is crucial to test the generalizability of the findings across diverse age ranges, ethnicities, genders, and socioeconomic backgrounds. The last remark is the need to further investigate the new concept of EC, both in relation to PA, resilience and other factors beyond these. Further examination of the antecedents, outcomes, and boundary conditions of EC may shed light on the underlying mechanisms that explain the results observed in the current study.

## **Conclusion**

In conclusion, the current study yielded no significant relation between PA and resilience, nor was there evidence for an indirect effect through EC. The lack of significance in the direct relation is noteworthy as it contradicts the existing literature. Although this topic has received considerable attention, these findings suggest that further investigation is necessary to determine whether this is due to study weaknesses or a true absence of effect in the examined population. It is worth noting that while there was no link between PA and resilience, the benefits of physical movement are not in question. This research has especially important implications for the concept of EC, which is in its early stages of development. While EC did not mediate the relation between PA and resilience in the present study, it is possible that it is part of a more complex pathway. Finally, EC was found to be positively associated with resilience, indicating that proactive cultivation of positive emotions may enhance an individual's ability to manage stressful experiences. These findings provide a foundation for future research in this area.

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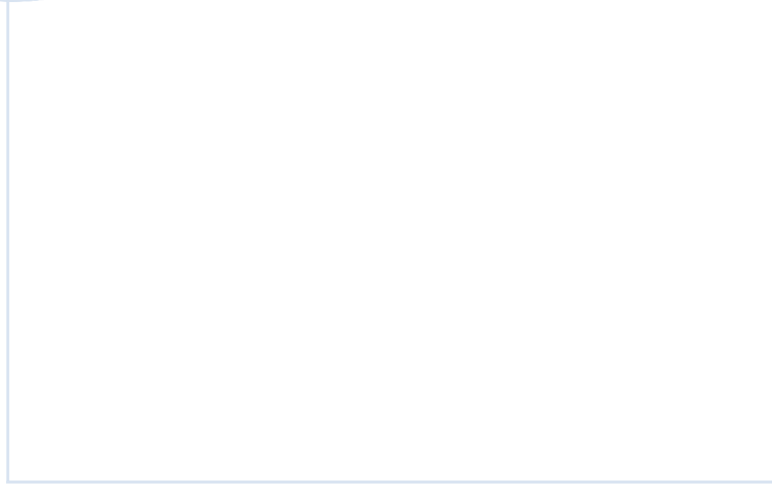
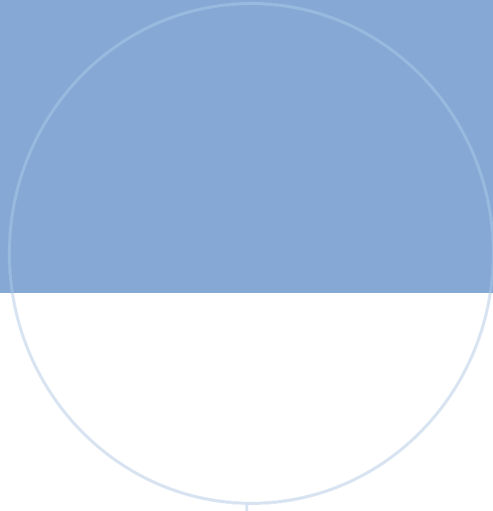
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