The Impacts of Mindfulness on the Relationship between Self-Regulation and Well-Being

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Abstract

The research on self-regulation has widely proven strong positive correlations between self-regulation and well-being. Mindfulness has also proven beneficial for well-being by reducing suffering. This study investigates the relationship between self-regulation and well-being in students to further validate existing findings. Following, it was investigated whether levels of mindfulness function as a partial mediator on this relationship to further explain the underlying mechanisms why self-regulation predicts well-being. Therefore, a sample of 102 university students filled in self-report questionnaires about self-regulation, well-being, and mindfulness, so intercorrelations between these three domains could be assessed. The analysis showed a significant positive influence of self-regulation on well-being ($p < .01$). A mediating role of mindfulness on this relationship was not found in this sample. Nevertheless, self-regulation was found to also predict levels of mindfulness. It is suggested to further investigate the exact interplay between these three variables.

Keywords: mindfulness, self-regulation, well-being, students, mediation

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Introduction

The way of interacting with the world around ourselves directly influences who we are and how we feel (Baumeister & Vohs, 2004). People must alter their behaviour, resist temptation or control their mood in order to be able to achieve desired goals (Vohs & Baumeister, 2004). This process is called self-regulation (Baumeister & Vohs, 2004). Which activities someone engages in as well as how stimuli are emotionally encountered are self-regulatory processes that directly influence one's well-being and overall satisfaction with life (Hooker et al., 2020). Research suggests the assumption that this relationship could be mediated by mindfulness (Gu et al., 2015). Mindfulness, the awareness obtained to intentionally attend to the present moment of experience in an accepting and non-judgmental way, is generated by self-regulation and found to increase well-being (Gu et al., 2015).

Self-Regulation

The term self-regulation refers to any process by which an individual regulates its state, including all types of goal pursuit (Vohs & Baumeister, 2004; Werner & Milyavskaya, 2019). It involves both voluntary behaviour and automatic processes, as for instance keeping one's body temperature constant (Vohs & Baumeister, 2004). Thereby, the level of voluntary self-regulating skills a person has is not given nor fixed but can be trained and developed (Vohs & Baumeister, 2004).

Thereby, research on self-regulation identified three subgroups, namely behavioural self-regulation, environmental self-regulation, and covert self-regulation (Bandura, 1991; Schunk & Zimmerman, 2013; Zimmerman, 2000). Behavioural self-regulation refers to observing and adjusting one's own performance, whereas environmental self-regulation is about observing and adjusting one's environment. Covert self-regulation entails monitoring

and adjusting cognitive, emotional, and affective states (Bandura, 1991; Zimmerman, 2000). To be able to successfully regulate oneself in all three subgroups research suggests that seven steps are to be met (Miller & Brown, 1991). These are to receive relevant information, evaluate and compare to norms, change trigger, search for options, formulate a plan, implement this plan, and assess its effectiveness (Miller & Brown, 1991).

Self-regulation can further be distinguished between effortful and effortless self-regulation (Werner & Milyavskaya, 2019). Whereas effortful self-regulation is an active process of coping with demands or temptations, effortless self-regulation happens automatic and arising temptations do not influence behaviour (Werner & Milyavskaya, 2019). Effortless self-regulation develops when an individual deliberately executes effortful self-regulation which over time becomes inherited and standard to the individual (Kabat-Zinn, 2015). Such strategies could include situation selection or modification, attentional deployment from a temptation or unpleasant stimulus, cognitive change such as reframing a desire, as well as response modulation (Werner & Milyavskaya, 2019).

Self-regulation is particularly needed when being faced with a decision, both conscious or unconscious, and includes the process of goal setting, developing strategies, behave in service of goals, and balancing behaviour when pursuing multiple goals (Baumeister & Vohs, 2004; Werner & Milyavskaya, 2019). Additionally, termination of action, i.e., to not do something, belongs to self-regulation (Karoly, 1993). Balancing is necessary when two goals conflict with each other, for instance, the pleasure of eating a cake may interfere with long-term health goals.

To keep balance, self-regulatory processes are in a constant feedback loop (Bandura, 1991; Schunk & Zimmerman, 2013; Shapiro et al., 2006; Zimmerman, 2000). These feedback loops work in such a way that individuals set themselves goals and compare their progress in relation to them (Lord et al., 2010; Zimmerman, 2000). If there is a discrepancy

between goals and progress, modifications to behaviour and cognitions are made to be in line with the goals. An important aspect of these feedback loops is the reference value which is the individual image of a desired state the current state is compared to. Reference value as well as one's goals are created in the so-called forethought phase, which happens before action and involves task analysis and self-motivational beliefs (Zimmerman, 2000). Further, the individual reference value is crucial for a person's perceived well-being (Groot, 2000; Kador & Chatterjee, 2020; Lord et al., 2010).

Well-Being

Definitions of well-being consider different domains that influence the currently experienced state of well-being (Halbreich, 2022). Definitions identify variables such as physical and emotional health, daily functions, financial status, and social interactions with one's community (Clifton & Harter, 2021; Groot, 2000; Halbreich, 2022). Thereby, the mentioned variables are all interlinked and influence each other (Halbreich, 2021). The World Health Organization defines health as "a state of complete physical, mental, and social well-being" (WHO, 2020).

Those interrelations of factors which ultimately lead to perceived well-being are different per individual and what may promote life satisfaction in one person, may be different in another (Clifton & Harter, 2021). Research suggests that the relation between an individual and her social environment is more important than objective assessment through, for instance, monetary values as it is often promoted in capitalistic systems (Halbreich, 2022). One's personal environment is the main determent for the point of reference which is the most important predictor of well-being (Groot, 2000; Kador & Chatterjee, 2020). For instance, a cross-country skier's well-being might be more affected by a broken ankle than a chess player's well-being under the same condition as they are more involved in environments where good physical performance is displayed. Perceived psychological, social,

and emotional states of well-being are assessed as they are set in relation to the individual points of reference (Kador & Chatterjee, 2020; Keyes et al., 2008). Together these states influence a person's hedonic well-being, i.e., the feeling towards life, and eudemonic well-being, i.e., functioning in life (Ryff & Keyes, 1995).

Changes in well-being can be achieved using self-regulation like coping or adaption (Halbreich, 2022; Kador & Chatterjee, 2020). Following, the view is promoted that each individual can take great responsibility for her own perceived well-being (Halbreich, 2018, 2022; Kador & Chatterjee, 2020).

Self-Regulation and Well-Being

As derived from the Self-Determination Theory, behaviour directly influences feelings of well-being in such that they provide means the potentials of autonomy, competence, and relatedness can be fulfilled (Deci & Ryan, 2012; Hooker et al., 2020). Nowadays, with growing globalization and interconnectivity of the world, people face increasingly more possibilities and have to take an almost unlimited amount of options into consideration (Baumeister & Vohs, 2004). Roets et al. (2012) have coined this the "tyranny of choice" and found out that the so-called "excess of freedom" in western industrialized countries has resulted in widely shared dissatisfaction with life (Roets et al., 2012). As it is impossible to take all existing possibilities of acting or consuming into consideration, people get conditioned to a constant feeling of missing out a better option than the just chosen one and that one's own potentials are not reached (Roets et al., 2012). This highly affects psychological, social, and emotional well-being and one's point of reference is altered (Kador & Chatterjee, 2020; Keyes, 2006). Such feelings tend to become present whenever decisions are to be made, be it about what to eat, wear, or do (Roets et al., 2012).

Due to possible altering in perception, individuals high in self-regulatory skills experience less temptations that may conflict with their goals which makes them less affected

by the mentioned effects (Hofmann et al., 2012; Roets et al., 2012). Particularly effortless self-regulation, by eliminating temptations, is argued to have a much greater influence on well-being and life satisfaction than effortful self-regulation (Werner & Milyavskaya, 2019). Both, the feeling towards life, as well as one's functioning in life are modified, causing the increases in perceived well-being (Ryff & Keyes, 1995). Mindfulness is found to affect feeling and functioning in life as well (Anālayo, 2019; Epstein, 1999; Kabat-Zinn, 2015; Schuman-Olivier et al., 2020).

Mindfulness

Mindfulness is the centre of Buddhist meditation and many other meditation practices aimed at getting insights about the self (Kabat-Zinn, 2015). The Zen as found in China, Korea, or Japan call it different but refer to the same key concept (Anālayo, 2019; Kabat-Zinn, 2015; Schuman-Olivier et al., 2020).

In essence, mindfulness is the awareness that arises when paying attention to the present moment nonjudgmentally and non-reactive (Epstein, 1999; Schuman-Olivier et al., 2020). By that, one's self is the only subject of this awareness and any insight is accomplished through introspection (Kabat-Zinn, 2015). Mindfulness consists of three essential building blocks, namely (1) intention, (2) attention, and (3) attitude which are not to be seen as stages but as cyclic processes occurring simultaneously (Shapiro et al., 2006).

(1) Intention entails that mindfulness activities must be on purpose, having the goal of shaping the mind by self-regulation, self-exploration by describing, and ultimately self-liberation (Shapiro et al., 2006). Thereby, practitioners are aware of an unfinished and imperfect understanding of oneself so allowance for change in personality and in the ways of practicing mindfulness is given (Epstein, 1999).

(2) Paying attention refers to observing one's internal and external experiences as they occur from moment to moment (Schuman-Olivier et al., 2020). By observing any moment

while also observing oneself when doing observation, the goal is to return to the things themselves, how they are and appear without any judgment included (Epstein, 1999; Shapiro et al., 2006). In short, how the experience itself is just in this moment, similar to the Kantian *Ding an Sich* (Adickes, 1924).

(3) Attitude is the particular way of viewing the world and refers to the general mindfulness qualities (Shapiro et al., 2006). Especially, the attitude to one's attention always being oriented towards (new) experiences is crucial (Schuman-Olivier et al., 2020). This attitude should be curious, non-striving, and accepting (Shapiro et al., 2006). Practitioners are encouraged to consciously commit themselves to those thought patterns so their interest for novel experiences as well as the allowance to let past experiences pass away is increased, to ultimately be able to reperceive life (Goleman & Horne, 1980).

As one can be mindful about experiences of any kind, it is deeply connected with leisure as any activity can be used as training (Carruthers & Hood, 2011; Ludwig & Kabat-Zinn, 2008). How far the "observing self" is trained is indicated by the extent a person is able to observe conscious contents (Shapiro et al., 2006).

Mindfulness and Well-Being

Goleman (1980) stated that when practicing mindfulness, "the phenomena contemplated become distinct from the mind contemplating them" (Goleman & Horne, 1980). Being mindful holds negative emotions and psychological affects in balanced awareness opposing to overidentification (Kabat-Zinn, 2015). Overidentifying with negative feelings leads to depressive recurrence and engagement in repetitive negative thinking (Ludwig & Kabat-Zinn, 2008). If a person is able to see something, for instance depressive feelings, she is realizing to be more than it and not just merely it (Ludwig & Kabat-Zinn, 2008; Shapiro et al., 2006). Emotional, social, or psychological parts of the selves one may have overidentified with, simply become stories as one realizes that selves are just

psychological constructs with everchanging build ups, beliefs, sensations etc. (Shapiro et al., 2006). Mindful identities shift from the contents of their awareness to awareness itself and the more is observed, the less a person is embedded with the contents (Shapiro et al., 2006). Thereby, it is not to be understood as passive or any other form of avoidance coping, but gives more value to pure moment-to-moment experiences instead (Shapiro et al., 2006).

Behaviour directly influences well-being, but research further suggests that the meaning salience, the degree to which a person is aware of what makes her life meaningful may be the actual factor (Hooker et al., 2020). This meaning salience is central in mindfulness practices as practitioners learn to see their life as temporarily what increases moment-to-moment appreciation (Kabat-Zinn, 2015; Ludwig & Kabat-Zinn, 2008; Moon, 2019; Schuman-Olivier et al., 2020). Reperceiving life likely affects personal reference values, making mindfulness a powerful tool to change states of well-being (Hooker et al., 2020).

Being mindful reduces suffering through multiple mechanisms, ranging from psychological change as a decrease in the perception of pain severity or an enhanced ability to reflect on choices including an increase in motivation for lifestyle changes. Additionally, through emotional change in form of reduction of stress symptoms, anxiety, or depression, as well as through social change by increased social connectedness and enriched interpersonal relationships (Ludwig & Kabat-Zinn, 2008). Practicing mindfulness provides a global desensitization that is beneficial to all emotional, psychological, or social experiences (Shapiro et al., 2006).

These effects already find application in Cognitive Behavioural Therapy and stress reduction therapies (Birtwell et al., 2019; Carruthers & Hood, 2011). Additionally, mindfulness provides the ground for Acceptance and Commitment Therapy and is seen to be the main reason for the positive health outcomes of Pilates training (Caldwell et al., 2009; Harris, 2006).

Self-Regulation and Mindfulness

Whether to engage in mindfulness practices, is a self-regulatory process that becomes effortless once a mindful perspective on life is adopted and affects all emotion, cognition, and behaviour (Birtwell et al., 2019). Unless self-regulation initiates mindfulness they are not the same, but self-regulation benefits mindfulness. Self-regulation defines behaviour and any interaction with the world, be it physical or psychological, provides means to practice mindfulness qualities (Carruthers & Hood, 2011; Ludwig & Kabat-Zinn, 2008). Self-regulatory individuals who step out of their comfort zone may be frequently exposed to unpleasant situations which are particularly important when practicing mindfulness as insights about why this situation feels unpleasant can be gathered (Shapiro et al., 2006). Unpleasant circumstances enable identifying one's own underlying mechanisms and the core of one's feedback loops and reference values as these situations provoke them (Shapiro et al., 2006; Zimmerman, 2000; Zimmerman & Kitsantas, 2014).

These insights are beneficial as individuals have greater possibilities to lessen discrepancies between their desired and current state as they are recognized by them being mindful (Lord et al., 2010). Further, these understandings of oneself better prepare for upcoming conditions as knowledge will be remembered when being confronted with difficult situations or rapid decisions (Epstein, 1999). This results in freedom in choice and less conditioned and automatic responses such as maladaptive coping or the occurrence of depressive symptoms (Shapiro et al., 2006; Thompson et al., 2010).

Aim of this study

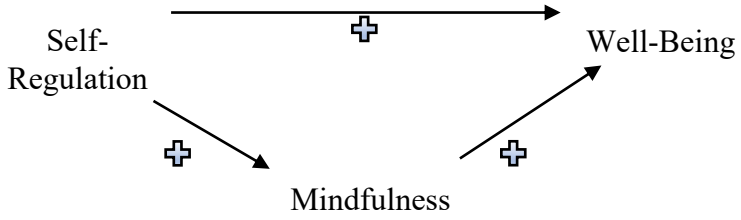
Literature widely agrees that self-regulation is beneficial for perceived well-being (Baumeister & Vohs, 2004; Karoly, 1993; Lord et al., 2010; Miller & Brown, 1991; Schunk & Zimmerman, 2013; Werner & Milyavskaya, 2019). Further, mindfulness receives increasing attention from science as positive influences of such qualities are identified

progressively (Birtwell et al., 2019; Carruthers & Hood, 2011; Schuman-Olivier et al., 2020; Shapiro et al., 2006). Some of the effects of mindfulness already find application in medicine and therapy (Gu et al., 2015; Ludwig & Kabat-Zinn, 2008; Moon, 2019). Following, the question arises whether mindfulness partially mediates the effect of self-regulation on well-being.

To investigate possible mediation, students will be the target group of this study. Students are seen as vulnerable to mental health issues as there are often exposed to the burden of stress which interacts with their identity development (Rückert, 2015). Self-regulation is inevitable for them as their study success is fully dependent on goal-directed activities students instigate, modify, and sustain (Schunk & Zimmerman, 2013). This includes for instance attending to university, rehearsing, relating learned knowledge to prior knowledge, or establishing productive social relationships. As mental health states are found to be directly related to regulating behaviour the found out relations are expected to be visible in this target group (Du et al., 2021). The partially mediating effect is expected as displayed in Figure 1.

Figure 1

The Mediating Effect of Mindfulness on the Relationship between Self-Regulation and Well-Being



Note: This figure explains the expected mediating effect of mindfulness on the relationship between self-regulation and well-being. High self-regulation influences well-being positively. This effect is expected to be stronger in the presence of mindfulness.

To examine the effects, the following hypotheses are proposed:

H1: High levels of self-regulatory capacities in students will correspond with high reported subjective well-being.

H2: The relationship between self-regulation and well-being is partially mediated by mindfulness.

Methods

Design

In this study, a cross-sectional within-groups study design was used to analyse a possible mediation effect of mindfulness. The dependent variable of interest was well-being. The independent variable was self-regulation which was expected to positively influence well-being. Mindfulness was predicted to have a partially mediating effect on the relationship between the two since it is influenced by the independent variable self-regulation, affects the dependent variable well-being, and the correlation between the independent and dependent variable is stronger in the presence of mindfulness as a mediator. Nonetheless, the mediation was expected to be partial as the positive effect of self-regulation on well-being also exists in the absence of mindfulness.

Participants

The participants for this study were purposefully recruited through messenger channels of the researcher and SONA by means of convenience and snowball sampling. SONA is a system used by the University of Twente to ensure every student participates in a minimum amount of research studies. Participants received 0.25 SONA credits for participating. Inclusion criteria to take part in this study were good abilities in the English language, as well as being a student. Thereby, the students' age, field of study, or year they are in were not of relevance. The demographic characteristics of the sample are displayed in Table 1. They

show that the majority was German, identified as female and was around 22 years old. Most of the students in the sample appeared to be bachelor students.

Table 1

Demographic Characteristics of the Sample (n=102).

Characteristics	n	%
Age		
Mean	22.07	
SD	2.79	
Gender		
Female	64	62.7
Male	30	29.4
Non-Binary/other	6	5.9
Prefer not to say	2	2
Nationality		
Dutch	26	25.5
German	57	55.9
Other	19	18.6
Education		
High school	79	77.5
Bachelor's degree	19	18.6

Other	4	3.9

Note. n = sample size; SD = standard deviation

Procedure

This research received approval on 25.10.2022 by the local Ethics Committee of the Faculty of Behavioural Science at the University of Twente. Participants received a link directing them to the online survey, where they took part in the study. The questionnaire was made available through the online survey site Qualtrics. Between the 17th of November 2022 and 31st of December 2022 it was possible to complete the questionnaire via all devices that feature an internet connection. After starting the survey, participants saw the informed consent, communicating the study's aim and duration of time which was estimated to be 15 minutes (see Appendix A). Following their agreement to it and voluntary participation, attendants were guided through batteries of questionnaire items. Every participant received the same survey with its items being in the same order. After completion, a gratitude statement for participating and contact information of the researcher were displayed as closing statement (see Appendix F). This procedure enabled no communication between participants.

Materials

The survey was separated into different question blocks, beginning with demographic baseline questions (see Appendix B). Questions about perceived well-being came after followed by items about self-regulation and levels of mindfulness.

Demographics and Baseline Questionnaire

Baseline questions were created that contained five items gathering participants' basic demographic information age, gender, occupation, level of education, and nationality (see Appendix B).

Mental Health Continuum Short Form (MHC-SF)

Well-being was measured by using the MHC-SF (Keyes, 2006; Keyes et al., 2008). The scale consists of 14 items that can be scored on a six-point Likert-scale ranging from 0 (*never*) to 5 (*every day*) to indicate how frequently a named aspect is experienced (see Appendix C). The MHC-SF contains three dimension (α = .74) to assess participants well-being, namely emotional well-being (α = .73), social well-being (α = .59), and psychological well-being (α = .67) (Keyes et al., 2008). Emotional well-being was determined by three items about happiness, interest, and satisfaction with one's life, including items such as "*In the past month did you feel interested in life?*". Social well-being got assessed by five items about social contribution, integration, actualization, acceptance, and coherence (i.e., social interest), with items such as "*In the past month did you feel that you had something important to contribute to society?*". Six items were used to weigh psychological well-being covering self-acceptance, environmental mastery, positive relations with others, personal growth, autonomy, as well as purpose in life. This subscale included items like "*In the past month did you feel that your life has a sense of direction or meaning to it?*". According to the scale's author, people that score ≥35 can be classified as having high mental health and the higher the score, the greater the subjective well-being of the participant with a maximum score of 70 (Keyes, 2002, 2006; Keyes et al., 2008). The MHC-SF demonstrated good internal consistency in past studies, with a Cronbach's alpha of .80. The Cronbach's alpha of the current sample is .90, following it is satisfactory. Additionally, the scale's test-retest reliability is moderate, over a three-month period .68 and over a nine-month period .65 (Keyes, 2002, 2006; Keyes et al., 2008; Lamers et al., 2011; Westerhof & Keyes, 2010)

Short Self-Regulation Questionnaire (SSRQ)

Self-regulation was measured using the SSRQ (Carey et al., 2004). It is a short form of the self-regulation questionnaire and consists of 31 items (α = .92) (see Appendix D). To

assess the ability to develop, implement, and flexibly maintain planned behaviour the scale covers the seven steps necessary to self-regulate as formulated by Miller and Brown (1991). Namely, these are to receive relevant information (e.g., "When it comes to deciding about a change, I feel overwhelmed by the choices."), evaluate the information and compare it to norms (e.g., "I have personal standards, and try to live up to them."), change trigger (e.g., "I tend to keep doing the same thing, even when it doesn't work."), search for options (e.g., "I can usually find several different possibilities when I want to change something."), formulate a plan (e.g., "Once I have a goal, I can usually plan how to reach it."), implement the plan and assess its effectiveness (e.g., "I learn from my mistakes.") (Miller & Brown, 1991). The scale's author breaks these dimension down into 5 subscales, that are mindfulness (α = .80), self-efficacy (α = .74), monitoring change (α = .68), goal focus (α = .72), and internal locus of control (α = .63) (Carey et al., 2004). Participants indicate on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) the extent to which they agree with the statements. With a maximum score of 155, higher mean scores indicate greater skills to self-regulate after reverse coding the negatively worded items. Previous studies found a average score of 116 and participants scoring above this cut off score will be treated as having good self-regulatory capacities (Carey et al., 2004; Chen & Lin, 2018). The SSRQ demonstrated a high internal consistency that is strongly in line with the original long version (r = .96) (Carey et al., 2004). Similar studies confirmed the validity of this scale indicating that it can be used as reliable measurement tool (Carey et al., 2004; Šebeňa et al., 2018; Vosloo et al., 2013).

Kentucky Inventory of Mindfulness Skills (KIMS)

To determine individual levels of mindfulness, the KIMS was used (Baer et al., 2004; Baer et al., 2009). The scale specifies four mindfulness skills, specifically observing, describing, acting with awareness, and accepting without judgement (see Appendix E). Each

of them was measured using a five-point Likert-scale so participants could indicate from 1 (*never or very rarely true*) to 5 (*very often or always true*) their opinion about themselves. The 39 items (α = .86) included statements such as "*I notice the smells and aromas of things.*" (observing, (α = .91)), "*I'm good at finding the words to describe my feelings.*" (describing, (α = .84)), "*When I'm reading, I focus all my attention on what I'm reading*" (act with awareness, (α = .83)), or "*I tend to evaluate whether my perceptions are right or wrong*" (accept without judgement, (α = .87)) (Baer et al., 2004). Negatively phrased items were reverse coded. Participants that score ≥125 are seen as mindful, and higher scores indicate greater mindful skills (Baer et al., 2004). The maximum score is 195. The items' validity was assessed using expert ratings (Baer et al., 2004). The KIMS has proven internal consistency and re-test reliability in previous studies and its results are in line with adjacent scales that measure mindfulness (Baum et al., 2010; Hansen et al., 2009; Höfling et al., 2011).

Data Analysis

Data analyses were carried out using the IBM SPSS statistics 28. In advance of analysing, all data were excluded that did not meet the inclusion criteria of being a student. Further, incomplete responses or participants' responses who did not agreed with the informed consent were excluded as well. This way, a total of 139 responses were narrowed down to 102 responses usable for analysis. Cronbach's alpha was calculated in order to test the reliability of the scales in this research. An alpha level of .05 was used for the following analyses.

First, descriptive analysis was executed to gain an overview about the data. The descriptives consist of mean and standard deviation of the participants' age as well as the samples' frequency and respective percentage for the demographic factors gender, nationality, and education. Additionally, to test assumptions of a linear regression, a predicted

probability plot was created to check for normality, and predicted values and residuals were plotted to check for homoscedacity. All main assumptions were met.

To answer the first hypothesis, *high levels of self-regulatory capacities in students will correspond with high reported subjective well-being*, a simple linear regression analysis was run and the Pearson correlation between self-regulation scores and well-being scores was calculated.

For answering the second hypothesis, *the relationship between self-regulation and well-being is mediated by mindfulness*, the PROCESS macro for SPSS was utilised (Hayes, 2017). A conceptual model with one mediation variable was investigated to check whether mindfulness mediates the positive effect self-regulation has on well-being. The analysis was conducted with well-being as the dependent variable, self-regulation as the independent variable, and mindfulness as the mediator. A mediation will be accepted if the correlations between (a) self-regulation and well-being, (b) self-regulation and mindfulness, and (c) mindfulness and well-being are significantly positive. If the correlation between self-regulation and well-being is significantly positive in the absence of mindfulness as a mediator, a partial mediation will be concluded. If this is not the case and self-regulation in the absence of mindfulness does not significantly correlate with well-being, a full mediation will be accepted.

Results

Descriptive Statistics

The descriptive statistics for the variables well-being, self-regulation, and mindfulness are displayed in table 2. They reveal that the mean scores for self-regulation are below the cut off score of 116, meaning that the sample's self-regulatory skills are slightly below averages of previous studies. Nonetheless, the well-being score was above the cut off score of 35, indicating a general high well-being in the sample. Thereby, the sample's emotional well-

being was the highest whereas social well-being was the lowest of the well-being subscales. The mindfulness levels of the sample are average compared to previous studies. Still, the standard deviation for self-regulation and mindfulness was higher than for well-being which means the variance in the well-being results is the smallest compared to self-regulation and mindfulness.

Table 2

Mean and Standard Deviations of the MHC-SF, SSRQ, and KIMS

	M	*SD*	*n*
Well-Being	47.35	11.49	102
Emotional	3.83*	1.10	102
Social	2.84*	1.22	102
Psychological	3.59*	1.15	102
Self-Regulation	108.95	18.10	102
Mindfulness	124.22	21.75	102

Note. M = mean; SD = standard deviation; n = sample size; * = mean score per item

In table 3 the well-being scores sorted by gender are displayed, including the well-being subscales. The numbers indicate the mean score per item. They reveal that all scored the lowest on social well-being, but female participants had the lowest scores on social well-being. Further, participants who are non-binary or do identify with a third gender scored higher on well-being than female or male participants. Particularly their social well-being score was high in comparison to the rest of the sample. The highest well-being was found in participants who did not want to share their gender identity. Differences in well-being scores

between different age groups were not found.

Table 3

Well-Being Scores by Gender

Gender	Total	Emotional	Social	Psychological	*n*
Male	3.38*	3.83*	2.83*	3.60*	30
Female	3.33*	3.83*	2.78*	3.54*	64
Other/Non-Binary	3.60*	3.78*	3.30*	3.75*	6
Prefer not to say	4.50*	4.50*	4.50*	4.50*	2

Note. * = mean score per item; n = sample size

In table 4 the Pearson correlations between the variables are presented. Significant positive correlations ($p < .01$) between self-regulation and well-being, between mindfulness and well-being, as well as between mindfulness and self-regulation were found.

Table 4

Pearson Correlations Between the Variables

	Well-Being	Self-Regulation	Mindfulness
Well-Being	.		
Self-Regulation	.63**	.	
Mindfulness	.42**	.63**	.

Note. **. Correlation is significant at the 0.01 level (2-tailed)

Inferential Statistics

A mediation model was estimated to test the mediation effects of mindfulness on the relationship between self-regulation and well-being. The mediation model's outcome can be analysed by reporting direct effect, indirect effect, and total effect as computed by the PROCESS macro (Hayes, 2017).

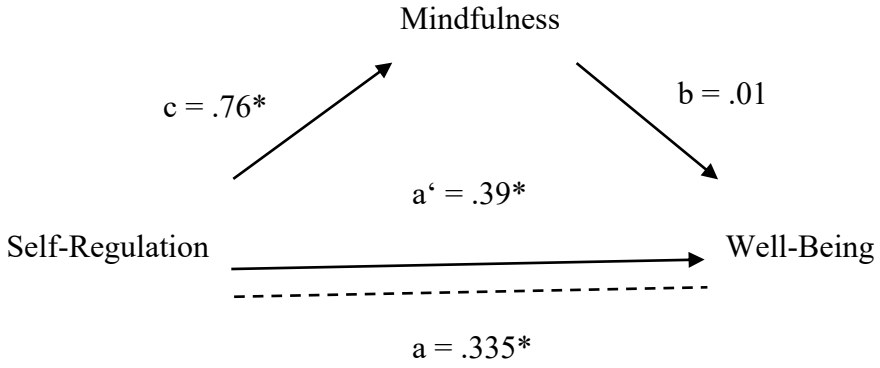
First, the regression results showed that self-regulation predicts well-being, $R^2 = .40$, $F(1, 102) = 67.23$, $p < .01$. The direct effect of pathway a' was significant, indicating the positive influence of self-regulation on well-being ($b = .39$, *s.e.* = .06, $t(102) = 6.1$, $p < .01$) (see Figure 2). Following, the first hypothesis, that higher levels in self-regulation will predict higher well-being, can be accepted.

Following, the indirect effect of the mediation variable mindfulness is demonstrated by the b-pathway of Figure 2. The factor loading is marginal and not significant. Thereby, the bootstrap intervals are taken into account ($b = .01$, *s.e.* = .05, 95% CI [-.12; .11]). According to the results, the second hypothesis, that mindfulness mediates the relationship between self-regulation and well-being is rejected. Furthermore, self-regulation significantly predicted mindfulness as displayed in the c-pathway (c = .76, s.e. = .09, 95% CI [.58; .94]).

Thirdly, the test demonstrated a positive and significant total effect of self-regulation of well-being ($b = .40$, *s.e.* = .05, $t(102) = 8.20$, $p < .01$), as represented in the a-pathway (see Figure 2).

Figure 2

Results for the Direct and Indirect Effect of the Mediation Analysis for Mindfulness



Note. * = $p < .01$.

Discussion

The aim of this study was to analyse the effects of self-regulatory capacities on perceived well-being in university students. The first hypothesis, that self-regulation predicts well-being can be accepted as in this sample a significant relationship between the two was found. A second hypothesis was proposed whether the relationship between self-regulation and well-being is mediated by mindfulness. As no significant mediation effect was found, this hypothesis can be rejected.

The first finding is in line with previous research which all found a strong correlation between self-regulatory capacities and perceived well-being (Hofmann et al., 2012; Karoly, 1993; Lord et al., 2010; Miller & Brown, 1991; Roets et al., 2012; Schunk & Zimmerman, 2013; Werner & Milyavskaya, 2019). Thereby, the sample's reported well-being (*M (MHC-SF)* = 47.35) was above the average scores of previous research (Keyes, 2002; Keyes et al., 2008; Lamers et al., 2011). The standard deviation of the well-being results was also low (*SD (MHC-SF*) = 11.49), further supporting the overall high perceived well-being in this sample of students. The expectation that students will report well-being scores which are below

average due to their vulnerability to mental health issues is debilitated by this sample (Rückert, 2015). The samples' self-reported self-regulatory capacities (*M (SSRQ)* = 108.95) are slightly below means of previous studies (Carey et al., 2004; Chen & Lin, 2018; Jakešová et al., 2016; Šebeňa et al., 2018; Vosloo et al., 2013). Nonetheless, their score deviates only seven score points from the defined cut-off score of 116.

Possible underlying effects of this relationship are changes in the feeling towards life, such as experiencing less temptations, and one's functioning in life, in form of improved means to achieve autonomy, competence, and relatedness in life (Deci & Ryan, 2012; Hofmann et al., 2012; Keyes et al., 2008; Roets et al., 2012; Ryan & Deci, 2017). Self-regulation enables to modify behaviour to be in line with one's wishes and ideals as decision can better be made and goals achieved more effectively (Lord et al., 2010). Additionally, self-regulation affects all determinants of well-being. Physical and emotional health, daily functioning, financial status, and social interactions with one's community can all be improved using forms of self-regulation (Clifton & Harter, 2021; Groot, 2000; Halbreich, 2022). The effect of self-regulation show that everybody is responsible to some extend for their own well-being (Kador & Chatterjee, 2020).

However, the sample at hand reported low social well-being opposing to their emotional and psychological well-being. Possible reasons could be the drastic change in students' social life due to the Covid pandemic as it was investigated in other studies (Eden et al., 2020; Kohls et al., 2021). Another factor could be the circumstance that this study was conducted in winter which is known for reducing states of well-being as well as limiting social interactions (Lewy et al., 2006; Molin et al., 1996). Still, participants who consider themselves as non-binary or identify with a third gender did not report low social well-being. Their social well-being was particular high in comparison to female participants, who were identified as having low social well-being in previous studies, too (Petrillo et al., 2015). It

may be influenced by the connectedness of the LGBTQ+ community where identities are likely to be embraced and cultivated, leading to greater feelings of social belonging (Garcia et al., 2020; Riggle & Rostosky, 2011).

The second hypothesis was rejected as no mediation effect of mindfulness on the relationship between self-regulation and well-being was found. Still, as in previous studies a correlation between mindfulness and well-being was found (Brown & Ryan, 2003; Eberth & Sedlmeier, 2012; Shapiro et al., 2008). Although this provided ground for the assumption of a possible mediation it was not the case in this sample. But instead of a mediation effect of mindfulness this study showed the predictive character of self-regulation on mindfulness. Previous studies discovered similar relationships (Howell & Buro, 2011; Shapiro & Schwartz, 2000) Following, it may be that self-regulation predicts both well-being and mindfulness what influenced the results of this study (Lyvers et al., 2014).

A person's environment is a crucial factor that influences the point of reference and following perceived well-being (Clifton & Harter, 2021; Krefis et al., 2018; Smyth et al., 2008). Adapting to one's environment or changing triggers are self-regulatory processes that can be achieved through self-regulation only, not through mindfulness qualities. Mindfulness may reduce suffering when being exposed to triggers but does not appear to change the triggers themselves. Nonetheless, the direct effect of self-regulation on well-being is smaller when checking for indirect effects of mindfulness as well. Therefore, mindfulness seems to have an effect on the relationship, but which has not proven significant in this study. Still, the effect of self-regulation on well-being is also significantly present, when not including a mediation effect of mindfulness, supporting the assumption that the mediation is only partial.

Strengths and Limitations

First, limitations were identified in the recruitment strategy which may have caused cohort bias (Willets, 2004). The majority of participants were students from western

universities. Consequently, the results may not be generalizable for students around the globe. As sampling was random, differing gender and age representations were the case, too. Most of the participants were either German or Dutch, around 22 years old, and female and following do not identify with a third gender. Hence, participants came from similar cohorts which may have biased the results as the students' environments are less diverse. The results display a tendency that the described correlations are different for non-binary/third gender participants, but not conclusions can be made due to the unequal representation.

Second, the general sample size can be identified as a limitation. Adjacent research conducted studies with several hundred participants (Birtwell et al., 2019; Brown & Ryan, 2003; Carruthers & Hood, 2011; Gu et al., 2015; Howell & Buro, 2011; Shapiro et al., 2008). Following, it is questionable whether the results of this study add to the global research on this topic as only data of 102 students was analysed.

Additional limitations concern the used scales. Positive about the scales is that they were all quick to fill in and had a good validation and consistency that takes subscales into account (Baer et al., 2009; Carey et al., 2004; Keyes et al., 2008). Also, the number of participating students was not limited and that it was possible to participants to fill in the questionnaire in an environment of their choice, decreased the risk of social-desirability bias (Grimm, 2010). However, the self-report questionnaires included no mechanism that could make verifying of the information possible. Similar studies used expert ratings or longitudinal study designs what enabled better validation of the data and hence more valuable results.

Implications and Future Recommendations

This study confirmed that self-regulation strongly predicts well-being. Thereby, correlations and causations could only be assumed. Hence, it might be valuable to investigate why self-regulation is predictive for well-being. Further, different subdomains of self-regulation, e.g., the internal locus of control, could be investigated whether particular parts of

self-regulation are responsible for predicting high well-being. The same applies for the correlation between self-regulation and mindfulness. According to the results of this study, self-regulation predicts mindfulness, but underlying causes are yet unknown. Longitudinal study designs could offer new explanations.

Next, mindfulness showed no mediation effect on the relationship between self-regulation and well-being in this study. But the mentioned limitations are to be kept in mind. Therefore, conducting similar research with a bigger sample may offer new insights into these intercorrelations with possible different results. Additionally, this study showed that different effects per gender are imaginable, but potentially not necessarily true due to the small sample size. Future research could be improved by reducing sampling bias through more organized recruitment that is aware of unequal representations (Huynh et al., 2014). Besides this, a between-group study design could also take differences between gender into account.

That the perceived well-being in this sample of students is above average gives additional implications. Before, it was proposed that students are vulnerable to mental health issues and therefore experience lower levels of well-being. As the results oppose this assumption, well-being in western students could be further investigated with bigger samples and longitudinal study designs which aim to offer causations next to correlations.

Conclusion

Self-regulation was identified by former research as inevitable to succeed in modern society and as strongly predicting levels of well-being. Mindfulness qualities were also found to facilitate perceived states of well-being what caused the idea of a possible underlying mediation of mindfulness. Self-regulation was found to indeed predict well-being. Additionally, self-regulation was also found to predict mindfulness. A mediation effect of mindfulness on the interplay between self-regulation and well-being was not found. Although

consistent measurement instruments were used effectively, thin sampling and a cross-sectional study design limit this study's findings. Still, this study contributed to this field by confirming the important role of self-regulation for well-being. Nonetheless, the particular role of mindfulness is to be further investigated to understand its role regarding perceived states of well-being.

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Appendix A

Informed Consent

This study investigates the influence of mindfulness on the relationship between self-regulation and well-being. You will be asked to answer questions regarding these factors. The survey is completely anonymous, and therefore nobody – including the researcher – can trace answers back to you. Before the survey starts, please read the following statements.

Taking part in the study

I have read and understood the study information provided above. I have been able to ask questions about the study and my questions have been answered to my satisfaction.

I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.

I understand that taking part in the study involves completing a survey containing personal questions.

Use of the information in the study

I understand that information I provide will be used for research purposes and will be anonymously reported in a bachelor thesis.

I understand that personal information collected about me that can identify me, such as my student number, will not be shared beyond the study team.

Future use and reuse of the information by others

I give permission for the survey database that I provide to be archived in the University of Twente Theses repository so it can be used for future research and learning.

If you have any questions regarding the research, you can e-mail the researcher: Felix Känder, f.kander@student.utwente.nl

I have read and understood the terms for participating in this research and thereby give my informed consent

Appendix B

Demographic Data

Please answer the following questions.

What is your gender?

Male

Female

Other / non-binary

Prefer not to say

What is your age?

What is your nationality?

Dutch

German

Other

Are you currently a student?

Yes

No

Please indicate your highest level of education you have finished.

Primary school

High school

Bachelor's degree

Master's degree

Doctorate

Other

Appendix C

Questions in Mental Health Continuum Short Form (MHC-SF)

How often (*every day, almost every day, about 2 or 3 times a week, about once a week, once or twice, or never*) in the past month did you feel ...

Emotional well-being

1. happy?
2. interested in life?
3. satisfied with your life?

Positive functioning

4. that you had something important to contribute to society? (social contribution)
5. that you belonged to a community (like a social group, your neighbourhood, your city, your school)? (social integration)
6. that our society is becoming a better place for people like you? (social growth)
7. that people are basically good? (social acceptance)
8. that the way our societiy works makes sense to you? (social cohenrence)
9. that you liked most parts of your personaity? (self-acceptance)
10. good at managing the responsibilities of your daily life? (environmental mastery)
11. that you had warm and trusting relationships with others? (positive relationship with others)
12. that you had experiences that challenged you to grow and become a better person? (personal growth)
13. confident to think or express your own ideas and opinions? (autonomy)
14. that your life has a sense of direction or meaning to it? (purpose in life)

Appendix D

Short Self-Regulation Questionnaire (SSRQ)

In the following, you will see statements about **self-regulation. For each of the following statements, please decide honestly whether they apply to you, using a scale from 1 (strongly disagree) to 7 (to strongly agree).**

I usually keep track of my progress towards my goals.

I have trouble making up my mind about things.

I get easily distracted from my plans.

I don't notice the effects of my actions until it is too late.

I am able to accomplish goals I set for myself.

I put off making decisions.

It's hard for me to notice when I've "had enough" (alcohol, food, sweets).

If I wanted to change, I am confident that I could do it.

When it comes to deciding about a change, I feel overwhelmed by the choices.

I have trouble following through with things once I've made up my mind to do something.

I don't seem to learn from my mistakes.

I can stick to a plan that's working well.

I usually only have to make a mistake one time in order to learn from it.

I have personal standards, and try to live up to them.

As soon as I see a problem or challenge, I start looking for all possible solutions.

I have a hard time setting goals for myself.

I have a lot of willpower.

When I'm trying to change something, I pay a lot of attention to how I'm doing.

I have trouble making plans to help me reach my goals.

I am able to resist temptation.

I set goals for myself and keep track of my progress.

Most of the time I don't pay attention to what I'm doing.

I tend to keep doing the same thing, even when it doesn't work.

I can usually find several different possibilities when I want to change something.

Once I have a goal, I can usually plan how to reach it.

If I make a resolution to change something, I pay a lot of attention to how I'm doing.

Often I don't notice what I'm doing until someone calls it to my attention.

I usually think before I act.

I learn from my mistakes.

I know how I want to be.

I give up quickly.

Appendix E

The Kentucky Inventory of Mindfulness Skills

Please indicate to what extent the statements apply to you with

1) Not at all
2) Slightly
3) A little
4) Moderately
5) Extremely

Observe Items:

I notice changes in my body, such as whether my breathing slows down or speeds up.

I pay attention to whether my muscles are tense or relaxed.

When I'm walking, I deliberately notice the sensations of my body moving.

When I take a shower or a bath, I stay alert to the sensations of water on my body.

I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.

I pay attention to sensations, such as the wind in my hair or the sun on my face.

I pay attention to sounds, such as clocks ticking, birds chirping, and cars passing.

I notice the smells and aromas of things.

I intentionally stay aware of my feelings.

I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.

I pay attention to how my emotions affect my thoughts and behavior.

I notice when my moods begin to change.

Describe Items:

I'm good at finding the words to describe my feelings.

I can easily put my beliefs, opinions, and expectations into words.

I'm good at thinking of words to express my perceptions, such as how things taste, smell or sound.

It's hard for me to find the words to describe what I'm thinking. –

I have trouble thinking of the right words to express how I feel about things. –

When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words. –

Even when I'm feeling terribly upset, I can find a way to put it into words.

My natural tendency is to put my experiences into words.

Act With Awareness Items:

When I do things, my mind wanders off and I'm easily distracted. –

When I'm doing something, I'm only focused on what I'm doing, nothing else.

I drive on "automatic pilot" without paying attention to what I'm doing. –

When I'm reading, I focus all my attention on what I'm reading.

When I do things, I get totally wrapped up in them and don't think about anything else.

I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted. –

When I'm doing chores, such as cleaning or laundry, I tend to daydream or think of other things. –

I tend to do several things at once rather than focusing on one thing at a time. –

When I'm working on something, part of my mind is occupied with other topics, such as what I'll be doing later, or things I'd rather be doing. –

I get completely absorbed in what I'm doing, so all my attention is focused on it.

Accepts Without Judgement Items:

I criticize myself for having irrational or inappropriate emotions. –

I tend to evaluate whether my perceptions are right or wrong. –

I tell myself that I shouldn't be feeling the way I'm feeling. –

I believe some of my thoughts are abnormal or bad and I shouldn't think this way. –

I make judgements about whether my thoughts are good or bad. –

I tend to make judgements about how worthwhile or worthless my experiences are. –

I tell myself that I shouldn't be thinking the way I'm thinking. –

I think some of my emotions are bad or inappropriate and I shouldn't feel them. –

I disapprove of myself when I have irrational ideas. –

Note: reversed items are indicated with -

Appendix F

Closing Statement

We thank you for your time spent taking this survey.

Your response has been recorded.