

Living well: Empirically Derived Draft of a Causal Model of Healthy and Effective Self-Regulation in the Scope of Self-Determination Theory

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Abstract

This study offers empirically derived indications on healthy and effective self-regulation. It develops a structural equation model (SEM) based on self-determination theory's (SDT) propositions on healthy and effective self-regulation. Beyond that, a first empirical validation step is taken with cross-sectional data (N = 1,024). The model shows acceptable global fit indices (CFI = .903, RMSEA = .084) and excellent local fit indices ($p < .001$ for all except one direct effect). It is emphasized that longitudinal and experimental research designs will be necessary to infer causations empirically. However, based on the theoretical and empirical grounding of the model as well as the local and global fit indices, indications for causations are discussed. The local fit indices imply that autonomous motivation, intrinsic life-goals orientation, and mindfulness positively affect psychological needs satisfaction as well as eudaimonic and hedonic well-being. Furthermore, they indicate that "mindfulness" and the newly integrated construct "clarity about personal values" have the strongest positive effects on individual health and efficacy. The newly integrated constructs "clarity about personal strengths" and "strengths-behavior fit" did not significantly affect health and efficacy. By having transferred the knowledge base of SDT into an empirically derived causal model of healthy and effective self-regulation, this study offers well-grounded indications on how "living well" can be fostered. These indications offer value for theory building and interventions in domains like psychotherapy, healthcare, organizations, sports, and education.

Keywords self-determination theory, eudaimonic well-being, hedonic well-being, psychological needs satisfaction, mindfulness, personal values

Introduction

There is a body of research in the scope of SDT that investigates healthy self-regulation. In this regard, four constructs are intensely researched: autonomous motivation (e.g., Sheldon & Elliot, 1999, Sheldon 2014), intrinsic life-goals orientation (e.g. Grouzet et al., 2005 on intrinsic aspirations; Kasser, 2004; Sortheix & Schwartz, 2017 on intrinsic personal values), mindfulness (e.g., Brown & Ryan, 2003), and psychological needs satisfaction (e.g., Ryan & Deci, 2017).

Furthermore, there is summarizing research in the scope of SDT that tries to grasp healthy self-regulation in an integrated way. The paper "The 'What' and 'Why' of Goal Pursuits: Human Needs and the Self-Determination of

Behavior” by Deci & Ryan (2000) is one of the fundamental papers in that regard. Besides, two research papers in the scope of SDT propose an integrated model of healthy self-regulation: The research paper “Living well: A Self-Determination Theory Perspective on Eudaimonia” by Ryan et al. (2008) and “The ‘Why,’ ‘What,’ and ‘How’ of Healthy Self-Regulation: Mindfulness and Well-Being from a Self Determination Theory Perspective” by Schultz & Ryan (2015). Ryan et al. (2008) label their integrating propositions as an “integrated, yet open, empirical model”. They state that the proposed constructs could be seen as grounded in a rather Aristotelean view on happiness (eudaimonia) but also integrate aspects of a rather hedonic view on happiness on the level of well-being outcomes. Ryan et al. (2008) and Schultz & Ryan (2015) state that autonomous motivation (the “Why”), intrinsic life-goals orientation (the “What”), and mindfulness (the “How”) would lead to the satisfaction of the three psychological needs: autonomy, relatedness, and competence. Thus, the satisfaction of the three basic psychological needs is seen as an outcome of the other three variables (see Figure 1).

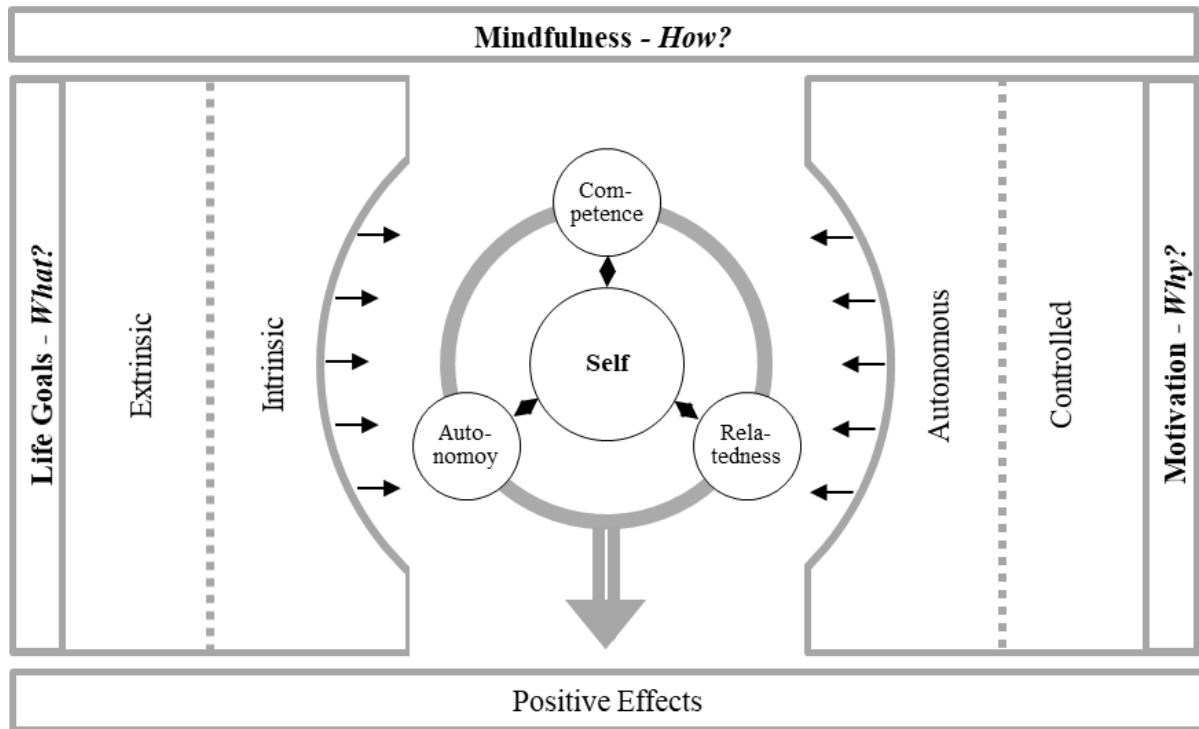


Figure 1 A basic model of healthy and effective self-regulation (own visualization based on Ryan et al., 2008 and Schultz & Ryan, 2015)

Ryan et al. (2008) make empirically grounded propositions that other constructs besides psychological needs satisfaction are also outcome variables of healthy self-regulation. They can be subdivided into variables that describe positive effects on the individual and the societal level. On the individual level, they describe positive effects like higher subjective and psychological well-being (Ryan et al., 2008). They explicitly emphasize positive affect and satisfaction with life (Diener et al., 2009) as two possible outcomes that could be subsumed under subjective well-being. Furthermore, they emphasize meaning in life (Steger, Frazier, Oishi, & Kaler, 2006) and subjective vitality (Ryan & Frederick, 1997) that could be subsumed under psychological well-being (Ryan et al., 2008). On the societal level, they describe positive effects such as prosocial and ecological-friendly behavior (Ryan et al., 2008).

There are other scientifically emphasized constructs and causal paths in the scope of SDT that go beyond the emphasized propositions by Ryan et al. (2008) and Schultz & Ryan (2015). E.g., the studies by Sheldon & Elliot (1999) and Sheldon (2014) analyze the effects of autonomous motivation on “goal progress”. These studies extend the positive effects of self-regulatory processes from well-being and health to also individual efficacy. This extension motivated the current study to draft a causal model of healthy and (in addition) “effective” self-regulation. Furthermore, it is aimed to integrate the most recent measurement instruments for each construct. E.g., for intrinsic life goals orientation, the PVQ-RR (Schwartz & Butenko, 2014) with an interpretation of intrinsic and extrinsic personal values based on Sortheix & Schwartz (2017) is used.

The studies by Ryan et al. (2008) and Schultz & Ryan (2015), as well as the described extending studies, depict a substantial overview of constructs and causations that represent healthy self-regulation (see Figure 1). The current study takes the next step and combines the proposed constructs and causations to an integrated causal model and makes a first validation step. As the resulting causal model has hypothesized 16 constructs and 27 causations, it would have been difficult to test it as a whole with a longitudinal or even experimental research design. Therefore, it is decided to use the structural equation modeling (SEM) method based on cross-sectional data to get first indications.

To conduct SEM, the current study orients on Weiber & Mühlhaus (2014). Given the remarks about SEM with cross-sectional data by Wunsch et al. (2010) as well as the methodological explanations by Weiber & Mühlhaus (2014) and Homburg & Klarmann (2006), it is perceived as a promising approach to discussing first hints for causalities in cross-sectional data. It is argued that the value of this approach goes beyond correlational analysis for two reasons: First, the hypothesized causal directions are well-grounded in existing research. Second, the large cross-sectional sample is used to test each causal path for falsification. Thus, a theoretical and empirical rationale is created behind the discussed indications that justify discussing causalities (Kline, 2015; Wunsch et al., 2010). The current study starts SEM by developing the conceptual model and research hypotheses based on theoretical and empirical studies mainly made in the scope of SDT. Therefore, the constructs and causations theorized by Ryan et al. (2008) and Schultz & Ryan (2015) are integrated. Furthermore, the model is refined with constructs and causations from recent research studies.

Conceptual Model and Research Hypotheses

Figure 2 gives an overview of the empirically derived causal model of healthy and effective self-regulation integrating all constructs and causations with the operationalization used. The hypotheses building is described in the following.

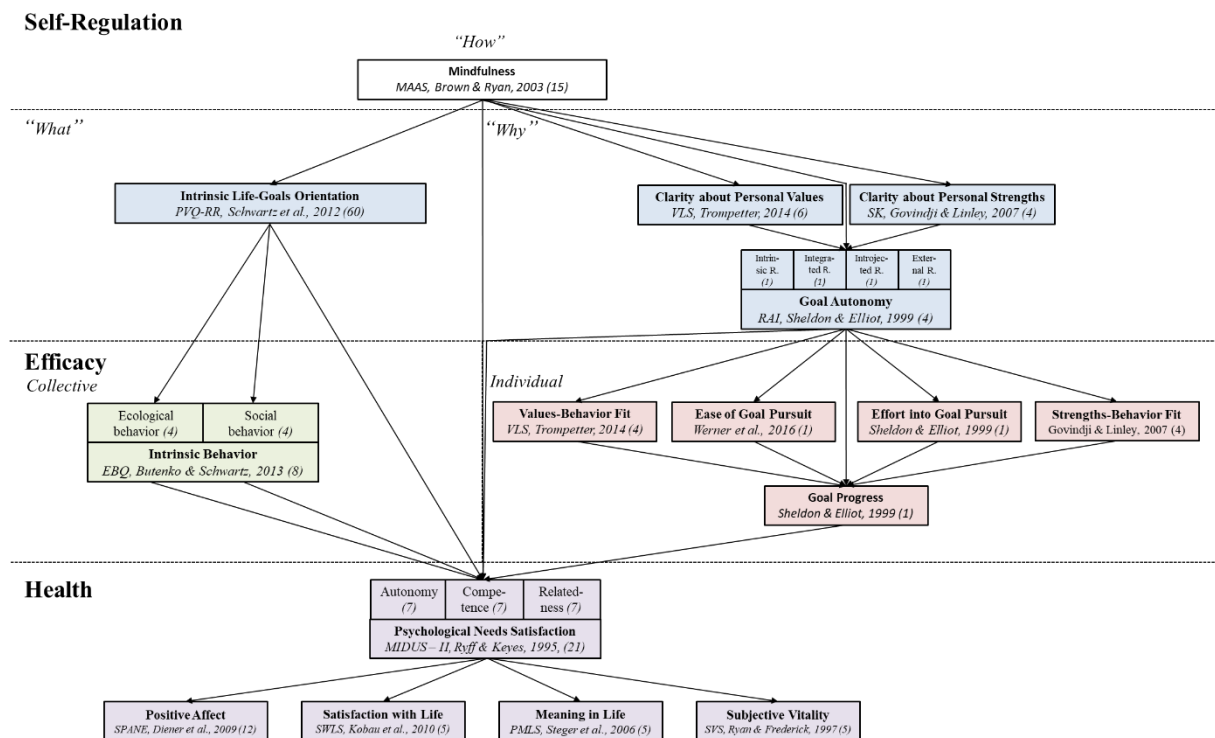


Figure 2 Transfer of SDT's understanding of healthy and effective self-regulation into a hypothesized causal model

The Outcome: Transferring SDT's understanding of health and efficacy into the structural equation model

In the scope of SDT, the satisfaction of the three basic psychological needs of autonomy, relatedness, and competence is seen as the essential nutriment for healthy functioning (Deci & Ryan, 2000). This perspective is supported by an extensive body of empirical studies showing positive relations of psychological needs satisfaction

with constructs that refer to well-being, engagement, and health (see Deci & Ryan, 2000). Based on Ryan et al., 2008, the current study conceptualizes health in the scope of SDT as the satisfaction of the three basic psychological needs and the causal consequence on the two essential well-being dimensions of hedonic and eudaimonic well-being. Empirical studies indicate that psychological needs satisfaction leads to hedonic well-being, e.g., subjective well-being (Ryan et al. 2008, Sheldon Ryan, & Reis, 1996, Neubauer & Voss, 2016) as well as to eudaimonic well-being, e.g., psychological well-being (Ryan et al., 2008, Sheldon et al., 1996). Therefore, positive affect (Diener et al., 2009) and satisfaction with life (Diener et al., 1985) are integrated as two dimensions of subjective well-being. Furthermore, meaning in life (Steger et al., 2006) and subjective vitality (Ryan & Frederick, 1997) are integrated as two dimensions of psychological well-being.

Motivated by Ryan et al. (2008), the current study integrates concepts that refer to individual and collective efficacy as output variables. Individual efficacy is integrated to measure effects that refer to more individualized measures of individual progress in life. For the concrete conceptualization, this study was inspired by Emmons (1986) and Sheldon & Elliot (1999), therefore referring to the goal progress of individuals. Collective efficacy is integrated to measure the effects of self-regulatory processes on the planet and the people. Promoting ecologically and socially sustainable development seems essential to face global challenges like social inequality and climate change (United Nations, 2015). In order to conceptualize collective efficacy, this study is inspired by Ryan et al. (2008) and refers to the daily ecological and daily social behavior of an individual (based on the EBQ by Butenko & Schwartz, 2013).

Sheldon & Elliot (1999) indicate through structural equation modeling with longitudinal data that goal progress leads to psychological needs satisfaction. However, a study by Sheldon & Kasser (1998) implies that the amount of increased well-being depends on the degree of “organismic congruence” (p. 1319), which recent studies would describe as the autonomy of goals. Nevertheless, the results indicate a causal relationship between goal progress and psychological needs satisfaction, independent of the goal’s autonomy. Thus, this study hypothesizes that goal progress causes psychological needs satisfaction. For ecological behavior, results by Brown & Kasser (2005) and Kasser (2009) indicate that ecological behavior leads to higher levels of psychological needs satisfaction and higher levels of well-being. Given the described central role of psychological needs satisfaction on well-being and health, this study argues that the positive effects of ecological behavior on well-being could be mediated through psychological needs satisfaction. Thus, it hypothesizes that ecological behavior causes psychological needs satisfaction. For social behavior, a study by Steger, Kashdan, & Oishi (2008) indicates that social behavior leads to higher levels of well-being. Based on Deci & Ryan (2000) and Ryan et al. (2008), this study argues that the positive effects of social behavior on well-being could be mediated through psychological needs satisfaction. Thus, it is hypothesized that social behavior causes psychological needs satisfaction. Based on these studies, the efficacy constructs are positioned as preceding to health, although they are also seen as output variables of healthy and effective self-regulation.

The Input: Transferring the “why”, “what”, and “how” of healthy and effective self-regulation into the structural equation model

The “Why”

In the scope of SDT, it is stated that the degree of self-determination could be used to specify the “why” of self-regulation that leads to health and efficacy (Ryan et al., 2008; Schultz & Ryan, 2015). Self-determined actions are stronger led by autonomous goals than by controlled goals. Autonomous goals are motivated by authentic interests and personal values, while controlled goals are motivated by external rewards and punishments or introjected feelings such as fear or shame (Sheldon & Elliot, 1999; Sheldon, 2014). Sheldon & Elliot (1999) show that individuals with rather autonomous goals make faster progress and have higher psychological needs satisfaction. The goal progress seems mediated by sustained effort to pursue an autonomous goal (Sheldon & Elliot, 1999, Smith et al. (2007, 2011). However, Werner et al. (2016) found that the mediational effect does not necessarily have to be the effort invested into autonomous goals but could be the ease and naturalness of goal pursuit. The interpretation is that goals pursued for autonomous reasons feel easier and more natural than those pursued for controlled reasons. By that, the progress of autonomous goals is faster.

Beyond SDT’s propositions (Ryan et al., 2008; Schultz & Ryan, 2015), two additional mediators between autonomous motivation and goal progress are hypothesized, “values-behavior fit” and “strengths-behavior fit”. For values-behavior fit, this study suggests, based on studies about bridging the intention-behavior gap (e.g.,

Sheeran, Norman, & Orbell (1999) in the scope of the theory of planned behavior (Ajzen, 1991) and a study about values-behavior congruence (Butenko & Schwartz, 2013), that autonomous goals could be seen as a type of intention, what Sheeran et al. (1999) label “attitudinal intentions”. Consequently, the identified reason for autonomous goals could be interpreted as a specification of values. Sheeran et al. (1999) show that attitudinal intentions are better predictors for behavior than controlled intentions. Thus, this study states that autonomy of goals, similar to the concept of attitudinal intentions (especially the identified reason), could more frequently lead to behavior congruent with personal values. Therefore, it is hypothesized that autonomy of goals leads to values-behavior fit, which is measured based on one dimension of the concept of valued living by Trompeter (2014). Based on a study about strengths knowledge and strengths use (Govindji & Linley, 2007), which shows a relation between strengths knowledge and strengths use, it is further suggested that personal strengths could also be seen as a well-integrated reason for goal pursuit. Although personal strengths are not explicitly measured as one reason for goal pursuit in the construct autonomy of goals (e.g., Sheldon & Elliot, 1999), it is suggested that autonomous goals also lead to behavior that encompasses more often the use of well-integrated constructs like personal strengths. As the construct strengths use measures how much individuals use their strengths in various settings (Govindji & Linley, 2007), it is hypothesized that autonomy of goals causes strengths use, which is label as “strengths-behavior fit” by the authors of this study.

The “What”

In the scope of SDT, it is stated that the content of an individual’s life goals, often referred to as aspirations or personal values, could be used to specify the “what” of self-regulation that leads to health and efficacy. A fundamental paper in this area was published by Grouzet et al. (2005). It empirically divides life goals into intrinsic and extrinsic aspirations. Intrinsic aspirations are conceptualized to arise from the innate natural human tendency to achieve effectiveness, connectedness, and coherence (Deci & Ryan, 2000). By that, they are characterized to be those kinds of life goals that rather lead to satisfying basic psychological needs (Deci & Ryan, 2000, Kasser, 2004). Examples of intrinsic aspirations are affiliation, self-acceptance, community, and physical health (Grouzet et al., 2005). Extrinsic aspirations are conceptualized to arise from the wish to get external signs of worth or contingent approval. By that, they are said to be less likely to lead to the satisfaction of basic psychological needs (Deci & Ryan, 2000). Examples of extrinsic aspirations are conformity, popularity, image, and financial success (Grouzet et al., 2005).

Empirical studies in the scope of the self-determination theory show that the pursuit of intrinsic life goals is positively related to the satisfaction of the basic psychological needs and other concepts of well-being and health (e.g., Kiaei & Reio, 2014, Kasser & Ryan, 1993, 1996, 2001) as well as to more social (McHoskey, 1999) and ecologically friendly (Brown & Kasser, 2005; Sheldon & McGregor, 2000) behavior. Based on the conceptualization of intrinsic life-goals and the studies that have been made on the positive effects of intrinsic life-goals on dimensions of well-being, health, and behavior; this study positions intrinsic life-goals orientation as preceding to health and efficacy.

The “How”

The third input concept of healthy self-regulation in the scope of SDT addresses “how” an individual can acquire autonomous motivation and intrinsic life goals to achieve psychological needs satisfaction. Empirical studies in the scope of SDT (e.g., Brown & Ryan, 2003) indicate that “mindfulness” fosters autonomous goals and intrinsic life goals, and psychological needs satisfaction (Ryan et al., 2008; Schultz & Ryan, 2015). In SDT, mindfulness is conceptualized as “a receptive state of mind wherein attention, informed by a sensitive awareness of what is occurring at the moment, plainly observes internal (e.g., psychological and somatic experiences) and external events that are taking place” (Brown & Ryan, 2003; Kabat-Zinn, 2003 cited by Schultz & Ryan, 2015, p. 84). Besides, it is often described as an awareness that is pre-reflexive and non-evaluative (Ryan et al., 2008; Schultz & Ryan, 2015). Based on the conceptualization of mindfulness and the studies that have been made on the positive effects of mindfulness, this study emphasizes mindfulness as being essential for healthy and effective self-regulation. It is seen as a construct that directly or indirectly influences all discussed constructs. Furthermore, it is suggested based on Schultz & Ryan (2015) that there is a reflexive state of mind that mediates the pre-reflexive state of mindfulness and the operationalization of self-determined inner drivers (autonomous goals). Based on Brown & Ryan (2003), Schultz & Ryan (2015) argue that mindfulness is associated with self-knowledge and self-insight (e.g. Silvia & Duval, 2001). Therefore, mindfulness is hypothesized also to cause higher levels of reflexive self-knowledge such as the recognition and knowledge of personal values (Trompeter, 2014). Besides, the current

study hypothesizes that another essential construct for reflexive self-knowledge is strengths knowledge (Govindji & Linley, 2007). By that, mindfulness is interpreted as a pathway to get clarity about what is important to oneself and a pathway to get clarity about one’s unique combination of talents, acquired knowledge, and skills. With this definition of strengths, this study builds on the strengths concept by Buckingham et al. (2003). To have a more consistent wording throughout the constructs, this study refers to the recognition and knowledge of personal values, which belong to the valued living scale by Trompetter (2014), as clarity about personal values and to strengths knowledge by Govindji & Linley (2007) as clarity about personal strengths. It is hypothesized that mindfulness causes clarity about personal values and clarity about personal strengths.

Method

Procedure and Participants

The cross-sectional data for structural equation modeling is gathered digitally. The questionnaire integrates all measured constructs as well as demographic questions. It also contains control questions to verify whether the survey was conducted thoroughly by the participants. Participants either complete the questionnaire self-selected or as part of a start-up accelerator program. The questionnaire was usable in English or German. The original sample consisted of N = 1,205 individuals. Based on the control questions, individuals that did not seem to conduct the questionnaire thoroughly were deleted. This selection step resulted in a reduced sample of N= 1,024 individuals. As two constructs were added to a later point in time, there is N = 144 for these two constructs (“clarity about personal strengths” and “strengths-behavior fit”). In the following, demographic characteristics of the participants are provided: Referring to the total sample, 612 (59.8 %) participants did the German version of the questionnaire, whereas 412 (40.2 %) participants did the English questionnaire. 585 (57.2 %) were female and 439 (42.8 %) were male. Most participants (854; 83.4 %) are in the range of 16 years to 40 years of age. A large proportion of participants lives in Germany (632; 61.7 %). 365 (35.6 %) participants stated to live in other countries. Concerning the type of employment, most of the participants are students (441; 43.1 %), followed by participants who are employed for wages (285; 27.8 %) and participants who are self-employed (120; 11.7 %).

Measures

As the current study integrates 16 measures, it presents their operationalization with referring characteristics in the form of a table (see Table 1). Adaptions that are made to the scales are presented below the table.

Table 1 Measurements and referring characteristics; * := adaptions integrated as discussed below the table

<i>Construct</i>	<i>Scale</i>	<i>Author(s), Year</i>	<i>Items</i>	<i>Answer Scale</i>	<i>Score</i>
<i>Mindfulness</i>	Mindfulness Attention Awareness Scale (MAAS)	Brown & Ryan (2003)	15	Likert scale from 1 (almost always) to 6 (almost never)	Mean
<i>Clarity about Personal Values*</i>	Valued Living Scale (VLS)	Trompetter (2014)	6	Likert scale from 1 (strongly disagree) to 6 (strongly agree)	Mean
<i>Clarity about Personal Strengths*</i>	Strengths Knowledge Scale (SKS)	Govindji & Linley (2007)	4	Likert scale from 1 (strongly disagree) to 6 (strongly agree)	Mean
<i>Goal Description*</i>	Personal Strivings (PS)	Emmons (1986)	1 for each goal	Qualitative	-
<i>Goal Autonomy</i>	Relative Autonomy Index (RAI)	Sheldon & Elliot (1999)	4 for each goal	Likert scale from 1 (strongly disagree) to 6 (strongly agree)	Relation of autonomous reasons to controlled reasons
<i>Ease of Goal Pursuit</i>	Ease of Goal Pursuit	Werner et al. (2016)	1 for each goal	Likert scale from 1 (strongly disagree) to 6 (strongly agree)	Mean

<i>Values-Behavior Fit*</i>	Valued Living Scale (VLS)	Trompetter (2014)	4	Likert scale from 1 (strongly disagree) to 6 (strongly agree)	Mean
<i>Strengths-Behavior Fit*</i>	Strengths Use Scale (SUS)	Govindji & Linley (2007)	4	Likert scale from 1 (strongly disagree) to 6 (strongly agree)	Mean
<i>Effort into Goal Pursuit</i>	Effort into Goal Pursuit	Sheldon & Elliot (1999)	1 for each goal	Likert scale from 1 (strongly disagree) to 6 (strongly agree)	Mean
<i>Goal Progress</i>	Goal Progress	Sheldon & Elliot (1999)	1 for each goal	Likert scale from 1 (strongly disagree) to 6 (strongly agree)	Mean
<i>Intrinsic Life-Goals Orientation*</i>	Revised Portraits Values Questionnaire (PVQ-RR)	Schwartz & Butenko, (2014); Hebllich & Terzidis (2016)	60	Likert scale from 1 (not like me at all) to 6 (very much like me)	Relative intrinsic life-goals importance
<i>Intrinsic Behavior*</i>	Everyday Behavior Questionnaire (EBQ)	Butenko & Schwartz (2013)	8	Likert scale from 0 (never) to 4 (always)	Mean
<i>Basic Psychological Needs Satisfaction</i>	Psychological Well-being Scale (MIDUS – II)	Ryff, 1989; Ryff & Keyes, (1995)	21	Likert scale from 1 (strongly disagree) to 6 (strongly agree)	Mean
<i>Positive Affect</i>	Scale for Positive And Negative Experience (SPANE)	Diener et al. (2009)	12	Likert scale from 1 (Never or very rarely) to 5 (very often or always)	Relative frequency of positive experiences
<i>Satisfaction with Life</i>	Satisfaction with Life Scale (SWLS)	Diener et al.; 1985; Kobau, et al., 2010)	5	Likert scale from 1 (strongly disagree) to 7 (strongly agree)	Mean
<i>Meaning in Life</i>	Perceived Meaning in Life Scale (PMLS)	Steger et al. (2006)	5	Likert scale from 1 (strongly disagree) to 7 (strongly agree)	Mean
<i>Subjective Vitality*</i>	Subjective Vitality Scale (SVS)	Ryan & Frederick (1997)	5	Likert scale from 1 (strongly disagree) to 7 (strongly agree)	Mean

Adaptions for measures

The authors made adaptations for some of the scales (marked with “*” in Table 1). These adaptations were primarily made based on recent research results about the scale. For clarity about personal values, four items of the *Valued Living Scale (VLS, Trompetter, 2014)* are included that represent the recognition and knowledge of personal values and have the highest factor loadings (Trompetter, 2014). Furthermore, two items were added by the authors (“I know my personal values” and “I have clarity about my deeply held values”). Those items were developed in iterative discussions between the authors and two experts from the field. For clarity about personal strengths, four items of the *Strengths Knowledge Scale (SKS, Govindji & Linley, 2007)*, the four included items are chosen from the five items with the highest factor loadings based on Govindji & Linley (2007). For goal description, participants are asked to list the personal goals in the context of work based on the *Personal Strivings instrument (PS, Emmons, 1986)*. The authors ask about personal goals in the context of work. For Values-Behavior Fit, four items of the *Valued Living Scale (VLS, Trompetter, 2014)* are used to measure the degree of fit between personal values and behavior. The four included items represent statements that measure the undertaking of behavioral actions congruent with personal values (Trompetter, 2014). For strengths-behavior fit, the four items of the *Strengths Use Scale (SUS, Govindji & Linley, 2007)* with the highest factor loadings are used.

Intrinsic Life-Goals Orientation is measured on the level of personal values based on the *Revised Portraits Values Questionnaire (PVQ-RR, Schwartz & Butenko, 2014)*. The version used in this study also includes “health” as a separate value with three additional items (Heblich & Terzidis, 2016). Based on Sortheix & Schwartz (2017) and Heblich & Terzidis (2016), ten growth-oriented values (including health) are interpreted as intrinsic, and eight anxiety-avoiding values are interpreted as extrinsic. The values humility and achievement are interpreted as neutral. To measure intrinsic life-goals orientation, one calculates the relative importance of intrinsic values. Based on the methodology in the aspiration index by Grouzet et al. (2005), the relative importance of intrinsic values is calculated by averaging the referring centered value means. For intrinsic behavior, the two dimensions “Universalism-Concern” and “Universalism-Nature” of the *Everyday Behavior Questionnaire (EBQ, Butenko & Schwartz, 2013)* are used to measure ecologically social behavior and sustainable behavior. For subjective vitality, five items of the *Subjective Vitality Scale (SVS, Ryan & Frederick, 1997)* are used. The scale initially encompasses seven items. However, Bostic et al. (2000) empirically find weaknesses concerning the validity of two items. Therefore, this study excludes those items.

Results

The Maximum Likelihood Estimator (MLE) is applied using SPSS AMOS to estimate the structural equation model. Wisner (2003) argues that this estimator has desirable asymptotic properties (e.g., minimum variance and unbiasedness) and is scale-free. This estimation method assumes univariate and multivariate normality (Weiber & Mühlhaus, 2014). However, recent research indicates that the MLE can be used for data with minor deviations from normality (Raykov & Marcoulides, 2008). Looking at results of the Shapiro-Wilk test, of the Kolmogorov-Smirnoff Test as well as at the critical ratios of the univariate and multivariate kurtosis and on plotted histograms, it is indicated that six constructs are normally distributed (mindfulness, autonomy of goals, intrinsic life-goals orientation, overall needs satisfaction, positive affect and satisfaction with life). The other constructs appeared approximately normally distributed. Gao, Mokhtarian, & Johnston (2008) argue that one possibility to reach a univariate and multivariate normal distribution is to delete true outliers. However, they suggest that deleting those outliers should be balanced against the model power loss in interpreting the results. They have shown in many data sets that the violation of the cut-off levels like in the present study rarely leads to changes in the global and local fit indices. In the present study, a control question is used to identify and then delete the participants who did not answer the questions thoroughly. Therefore, it was decided to keep all remaining observations. Thus, it is admitted to have limitations concerning the univariate and multivariate normal distributions. However, based on Gao et al. (2008), those limitations for structural equation modeling are accepted.

Based on the remarks by Homburg & Klarmann (2006) and Weiber & Mühlhaus (2014) on structural equation modeling, the estimated SEM was slightly adapted based on modification indices. However, as the model is well-grounded in empirical studies, the model was only adapted to the point until it had acceptable global fit indices. Figure 3 shows the causal paths that had to be rejected (red) and added (blue) in this process. Figure 4 shows the resulting SEM in SPSS AMOS with the referring standardized direct effects in Table 2 and the standardized total effects in Table 3.

Self-Regulation

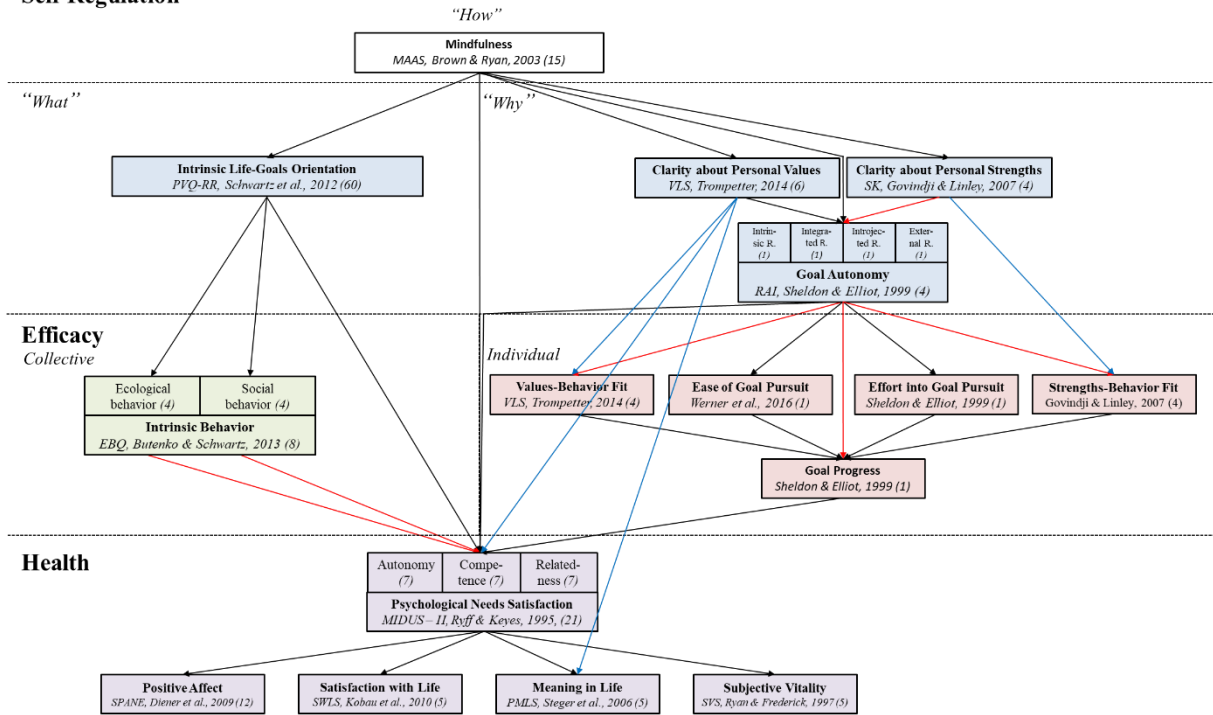


Figure 3 Hypothesized causal model with the hypotheses that were rejected (red) and paths that were added (blue)

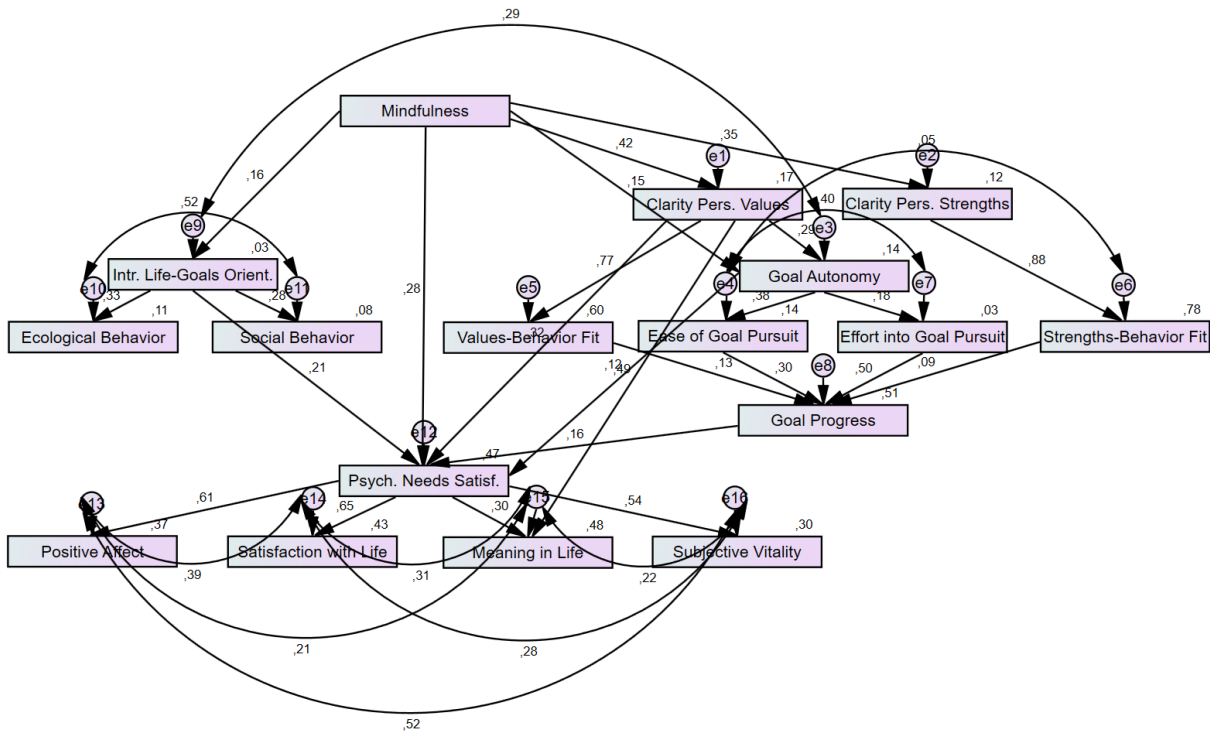


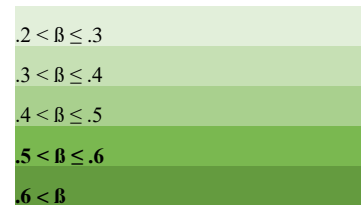
Figure 4 Structural equation model in SPSS AMOS with standardized estimates

Table 2 Standardized direct effects and referring p-values, ***: $p < .001$

Paths			Estimate	p-value
Mindfulness	→	Clarity about Personal Values	.416	***
	→	Clarity about Personal Strengths	.349	***
	→	Goal Autonomy	.152	***
	→	Intrinsic Life-Goals Orientation	.158	***
	→	Psychological Needs Satisfaction	.282	***
Clarity about Personal Values	→	Goal Autonomy	.288	***
	→	Values Behavior Fit	.774	***
	→	Psychological Needs Satisfaction	.317	***
	→	Meaning in Life	.492	***
Clarity about Personal Strengths	→	Strengths-Behavior Fit	.885	***
Intrinsic Life-Goals Orientation	→	Ecological Behavior	.334	***
	→	Social Behavior	.282	***
	→	Psychological Needs Satisfaction	.214	***
Goal Autonomy	→	Ease of Goal Pursuit	.379	***
	→	Effort into Goal Pursuit	.178	***
	→	Psychological Needs Satisfaction	.122	***
Values Behavior Fit	→	Goal Progress	.128	***
Ease of Goal Pursuit	→	Goal Progress	.296	***
Effort into Goal Pursuit	→	Goal Progress	.502	***
Strengths-Behavior Fit	→	Goal Progress	.094	.055
Goal Progress	→	Psychological Needs Satisfaction	.159	***
Psychological Needs Satisfaction	→	Positive Affect	.610	***
	→	Satisfaction with Life	.653	***
	→	Meaning in Life	.297	***
	→	Subjective Vitality	.545	***

Table 3 Standardized Total Effect and referring p-values; **: p < .01, -: no data)

	Clarity about Personal Values	Clarity about Personal Strengths	Intrinsic Life-Goals Orientation	Goal Autonomy	Values-Behavior Fit	Ease of Goal Pursuit	Effort into Goal Pursuit	Strengths Behavior Fit	Ecological Behavior	Social Behavior	Goal Progress	Psychological Needs Satisfaction	Positive Affect	Satisfaction with Life	Meaning in Life	Subjective Vitality
Mindfulness	.416**	.349-	.158**	.272**	.322**	.103**	.049**	.308-	.053**	.045**	.125**	.501**	.306**	.327**	.353**	.273**
Clarity about Personal Values	0	0	0	.288**	.774**	.109**	.051**	0	0	0	.157**	.377**	.23**	.246**	.604**	.205**
Clarity about Personal Strengths	0	0	0	0	0	0	0	.885-	0	0	.083-	.013-	.008-	.009-	.004-	.007-
Intrinsic Life-Goals Orientation	0	0	0	0	0	0	0	0	.334**	.282**	0	.214**	.131**	.14**	.064**	.117**
Goal Autonomy	0	0	0	0	0	.379**	.178**	0	0	0	.202**	.154**	.094**	.101**	.046**	.084**
Values-Behavior Fit	0	0	0	0	0	0	0	0	0	0	.128**	.02**	.012**	.013**	.006**	.011**
Ease of Goal Pursuit	0	0	0	0	0	0	0	0	0	0	.296**	.047**	.029**	.031**	.014**	.026**
Effort into Goal Pursuit	0	0	0	0	0	0	0	0	0	0	.502**	.08**	.049**	.052**	.024**	.043**
Strengths-Behavior Fit	0	0	0	0	0	0	0	0	0	0	.094-	.015-	.009-	.01-	.004-	.008-
Goal Progress	0	0	0	0	0	0	0	0	0	0	0	.159**	.097**	.104**	.047**	.087**
Psychological Needs Satisfaction	0	0	0	0	0	0	0	0	0	0	0	0	.61**	.653**	.297**	.545**



The bootstrapping method in SPSS AMOS (Nevitt & Hancock, 2001; Hu & Wang, 2010) was used to calculate the significance levels for total effects. The significance was measured two-tailed with a confidence interval of 0.95. As bootstrapping is not possible with missing data, the two strengths constructs (“clarity about personal strengths” and “strengths behavior fit”) were excluded. This exclusion was only made for the calculation of the significance of the total effects. For all other calculations, they are integrated.

For global fit, Homburg & Klarmann (2006) suggest using RMSEA, SRMR (Standardized Root Mean Square Residual), CFI, NNFI (Nonnormed Fit Index), which is sometimes also called TLI (Tucker Lewis Index), as well as a Chi-square/df. Homburg & Klarmann (2006) argue, based on Browne & Cudeck (1992) as well as on Schermelleh-Engel, Moosbrugger, & Müller (2003), that an RMSEA respectively an SRMR < 0.05 could be interpreted as a good model fit, while an RMSEA respectively an SRMR < 0.1 could be described as an acceptable model fit. CFI and NNFI should be higher than 0.9. Furthermore, Chi-square/df should be smaller than 3. However, Homburg & Klarmann (2006) state that those cut-off levels should not be considered absolute but rather a rough guideline. Thus, a violation of a cut-off level would not automatically lead to the rejection of the model but should always be documented (Homburg & Klarmann, 2006).

In this study, all fit indices except the SRMR are calculated. As SPSS Amos provides no SRMR if one has missing data, which was the case for “clarity about personal strengths” as well as for “strengths-behavior fit” (N = 133 in comparison to the overall n = 1,024), SRMR was not calculated. Table 4 shows the results for the global fit indices.

Table 4 Global fit indices for the structural equation model of the final causal model

RMSEA	CFI	NNFI/TLI	CHI-SQUARE/df
.084	.903	.853	8.285

Discussion

The overall model shows an *acceptable global model fit* for RMSEA, CFI, and limitations for the cut-off level for NNFI and Chi square/df. Based on Homburg & Klarmann (2006), it is argued that due to the complexity of the model, such limitations may be accepted and do not lead to rejection. Better global fit indices could be easily constructed by cutting away or adding more paths based on the modification indices. However, this study aimed to validate SDT’s propositions. Thus, staying as close as possible to the initially hypothesized model is reasonable. That is why the model was only adapted until an acceptable global fit was reached based on RMSEA and CFI. Beyond the acceptable global fit, the model shows *excellent local model fit* ($p < .001$ for all except one direct effect, see Table 2).

Ryan et al. (2008) propose that well-being and health could be conceptualized at the core through satisfying the three basic psychological needs. The nutriment of these essentials should lead to subjective and psychological well-being. A positive relation is supported in our model through significantly positive direct effects from psychological needs satisfaction to two facets of subjective well-being: Satisfaction with Life ($\beta = .653^{***}$) and Positive Affect ($\beta = .61^{***}$), as well as to two facets of psychological well-being: Presence of Meaning in Life ($\beta = .297^{***}$) and Subjective Vitality ($\beta = .545^{***}$) (see Table 2). Schultz & Ryan (2015), as well as Ryan et al. (2008) propose that mindfulness (the “how”), autonomy of goals (the “why”), and intrinsic life-goals orientation (the “what”) foster well-being and health. *This core of SDT’s propositions on self-regulation and health is supported by the SEM’s total effects.* Mindfulness shows the strongest effects (e.g. $\beta = .501^{**}$ on psychological needs satisfaction). For autonomy of goals and intrinsic life-goals orientation the effect is substantially weaker (e.g. $\beta = .154^{**}$ respectively $\beta = .214^{**}$ on psychological needs satisfaction). Furthermore, the study indicates that one psychological construct that has not been emphasized in the scope of SDT has a significantly positive effect on health. Namely, the newly integrated construct “clarity about personal values” has strong total effects on constructs that are related to health (e.g., $\beta = .377^{**}$ on psychological needs satisfaction and $\beta = .604^{**}$ on meaning in life) (see Table 3). The opposite is the case for the newly integrated construct “clarity about personal strengths” which shows none to weak total effects on health constructs. In contrast to the proposition of Ryan et al. (2008), ecologically friendly and social behavior did not have a significantly positive effect on the health constructs, and the relations were therefore deleted in the adaption process of the SEM. The reason for this insignificance may be found in the operationalization that was used (EBQ, Butenko & Schwartz, 2013). Therefore, further studies that

may test other operationalizations for ecologically friendly and social behavior are necessary to analyze the relation to health constructs.

Besides mindfulness, clarity about personal values and autonomy of goals have significantly positive effects on goal progress ($\beta = .125^{**}$; $\beta = .157^{**}$, $\beta = .202^{**}$), which is used as a representative construct for individual efficacy. Mindfulness also has a weakly positive effect on collective efficacy for which socially ($\beta = .053^{**}$) and ecologically sustainable ($\beta = .045^{**}$) behavior are considered representative constructs. This effect seems to be mediated by intrinsic life-goals orientation (see Table 3). These results support the proposition of Ryan et al. (2008) that the “how”, the “why”, and the “what” of healthy self-regulation do also have effects on individual and collective efficacy. As mediational constructs between autonomy of goals and goal progress, “effort” into (Sheldon, 1999) as well as “ease” of the goal pursuit (Werner et al., 2016) were supported. Values-behavior fit and strengths-behavior fit were rejected as mediators between autonomy of goals and goal progress. However, they seem to be mediational between clarity about personal values respectively clarity about personal strengths and goal progress. Finally, *goal progress also has a significantly positive effect on health* (e.g. $\beta = .159^{**}$ on psychological needs satisfaction). However, this effect is substantially weaker than the effect of mindfulness and clarity about personal values (see Table 3).

Overall, the drafted causal model implies that individuals, who strive for healthy and effective self-regulation, may benefit from exercising *present moment awareness*. Being in the present moment has been shown to influence well-being and health directly positively. The SEM also indicates possible causal chains beginning with mindfulness that appear parallel to this direct effect on psychological needs satisfaction. Through mindfulness, individuals may bring unconscious layers of personality into consciousness, which foster health and effectiveness. In specific terms, the non-judgmental and observing character of mindfulness could help reveal personal values and strengths as well as to set autonomous goals that are in congruence with them. This process also appears to foster efficacy (goal progress) and health. Besides that, the construct of mindfulness seems to be a pathway to pursue more intrinsic life goals.

Furthermore, the drafted causal model indicates that the construct *clarity about personal values* has a unique role beyond the currently described causal chain and indirect effects. The construct seems as important as the three constructs mindfulness, autonomy of goals and intrinsic life-goals orientation for well-being and health. New studies in the scope of SDT are encouraged that further analyze the construct clarity about personal values and its role in healthy and effective self-regulation.

Beyond the positive implications of our model for individual health and effectiveness, it is argued that it also indicates that self-regulation in the scope of SDT yields *positive effects on the collective level*. Mindfulness seems to give individuals a stronger orientation to their intrinsic values, which is also connected to facets of intrinsic behavior. Strictly speaking, the results indicate that social and ecological friendly behavior can be fostered through mindfulness which could positively affect society and the planet.

Limitations

A significant limitation of the study is that it does not use longitudinal data to test causalities. Many scholars see changes in time throughout the variables as necessary to test causalities (Wunsch et al., 2010). However, some scholars propose that indications for causalities can also be derived from cross-sectional data if there is a solid theoretical rationale behind them (Kline, 2015; Weiber & Mülhhaus, 2014; Wunsch et al., 2010). The current study's authors admit that longitudinal and experimental research design is necessary to test for causalities empirically. Due to the complexity of the hypothesized causal model, it is argued that it would be difficult to test it with longitudinal data or even in an experimental setting. Therefore, the path was taken to firmly ground the hypothesized SEM with existing theoretical and empirical studies. Trying to falsify well-grounded hypothesized causal relations based on cross-sectional data is seen as a reasonable procedure that can give first indications for causalities. Besides the cross-sectional research design, a limitation is that it cannot be claimed that the used sample is representative in a particular dimension. Furthermore, as only quantitative measurement instruments were used to measure the constructs, there could be common method bias (Greve, 2006; Söhnchen, 2007). This study followed the four recommended methodological steps by Söhnchen (2007) when only singular data is used to prevent this bias. Moreover, there is neither a multivariate nor a univariate normal distribution for all constructs. Given studies with similar issues (e.g., Gao et al., 2008) and research on structural equation modeling (Weiber &

Mühlhaus, 2014), this study balanced deleting outliers against the model power loss in interpreting the results and decided only to delete outliers that did not do the questionnaire attentively based on the control question.

Conclusion

This study leveraged the knowledge base of self-determination theory to empirically derive a causal model of healthy and effective self-regulation. The results support SDT's core propositions (Ryan et al., 2008; Schultz & Ryan, 2015) that mindfulness, intrinsic life-goals orientation, and autonomy of goals are essential for health and efficacy. Furthermore, a new construct, clarity about personal values, has been identified as essential. Besides, it is indicated that clarity about personal strengths and using them does not impact health and efficacy significantly. Thus, the results, on the one hand, support the proposed causal chains of modern interventions like "Acceptance and Commitment Therapy" (e.g., ACT, Hayes et al., 2016), which focus on *mindfulness* and *clarity about personal values*, but on the other hand, raise questions concerning interventions that mainly focus on getting clarity about personal strengths and using them (e.g., Buckingham et al., 2003). As the drafted model was only tested for falsification with cross-sectional data, we see it necessary to further validate the single parts of the model with longitudinal data and experimental settings. Our future work will contribute to this process by empirically developing and testing comprehensive interventions in the context of organizations that focus on mindfulness, intrinsic life-goals orientation, autonomous motivation, and clarity about personal values. Thus, we aim to put scientific knowledge into practice and further validate the discussed positive effects of specific self-regulatory processes on health and efficacy. However, as the discussed implications are theoretically and empirically well-grounded, we encourage to test discussed implications in fields like psychotherapy, healthcare, organizations, sports, and education. We close with a quote by the psychologist Carl Gustav Jung (1973, p. 33) that represents the developed model well and that draws a vivid picture of the underlying philosophy:

"Your vision will become clear only when you can look into your own heart.

Who looks outside, dreams; who looks inside, awakes."

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