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Meaningfulness as Satisfaction of Autonomy, Competence, Relatedness, and Beneficence: Comparing the Four Satisfactions and Positive Affect as Predictors of Meaning in Life

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Abstract Positive affect (PA) has consistently been shown to predict meaning in life (MIL). In one of the first investigations to examine multiple predictors of MIL simultaneously, we tested in three studies the hypothesis that satisfactions associated with being benevolent and fulfilling psychological needs for autonomy, competence, and relatedness are more central predictors of MIL, and could explain the correlation between PA and MIL. Study 1, a cross-sectional survey, regressed the four suggested factors and PA simultaneously on MIL, showing that all four emerged as independent predictors, whereas PA and MIL were no longer connected. Study 2 looked at recollections of meaningful situations, showing that all four satisfactions *and* PA emerged as independent predictors of situational meaning. Study 3 used a diary method to show that daily fluctuations in autonomy, competence, relatedness, beneficence, *and* PA all simultaneously and independently predicted daily sense of meaning. However, a brief longitudinal study showed that whereas combined satisfaction of autonomy, competence, relatedness, and beneficence at T1 predicted general sense of MIL at T2, PA did not. Together, these studies show that the four satisfactions consistently emerge as independent predictors of both general and

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short-term meaning, in some situations even accounting for the relation between PA and general MIL.

Keywords Meaning in life · Self-determination theory · Benevolence · Positive affect

1 Introduction

Having meaning in life (MIL) is connected to key aspects of human wellness (Steger 2012; Wong 1989), but what makes life meaningful? The recent upsurge of empirical interest in the topic has produced investigations into, for example, the role of positive affect (PA; King et al. 2006), social threats (Hicks et al. 2010), and death-relevant thoughts (Vess et al. 2009) among many other variables that may influence our evaluations of meaning in life. However, these investigations tend to look at only one potential predictor of MIL at a time, and investigations comparing multiple constructs predictive of meaning are rare. Furthermore, research on the topic would benefit from a stronger theoretical basis for selecting and comparing potential influences on MIL.

Accordingly, the present paper has two aims: First, to identify and simultaneously test four predictors of meaning that we find theoretically most viable: autonomy, competence, relatedness, and beneficence. We argue that in addition to being centrally important factors of human wellness (Deci and Ryan 2000; Aknin et al. 2013), they together capture many central intuitions we have about what makes life meaningful. Especially beneficence as a sense of prosocial impact has not previously received the research attention it deserves. Second, we further investigate whether these four satisfactions could explain the previously established connection between PA and MIL. Could it be that the connection between PA and MIL is fully accounted for by the fact that these four factors are important predictors of *both* PA and MIL?

We believe that this kind of examination that looks at the interrelations between more 'hedonistic' aspects of well-being such as positive affect (Diener et al. 1999) and more 'eudaimonic' aspects of well-being such as basic psychological needs and meaning in life (Waterman 1993; Ryan and Deci 2001; Delle Fave et al. 2011) will contribute to our understanding of the nature of well-being and how to make such distinctions within it (see Ryan and Martela 2016; Steger et al. 2008a, b). While some see meaning in life and positive affect as relatively independent dimensions of human experience (e.g. Baumeister et al. 2013), here we join other researchers (e.g. Shrira et al. 2011) in examining how one might interact with the other.

2 Potential Predictors of Meaning

Arguably the most frequently studied predictor of MIL in recent literatures has been positive affect. In a widely cited paper, King et al. (2006) showed that PA and MIL are correlated both in general evaluations of life (Study 1) and daily evaluations (Study 2). In addition experimentally induced positive mood increased participants' evaluations of MIL (Study 5). These results have been replicated in subsequent studies (Hicks et al. 2010; Hicks and King 2008) that have shown, for example, that individuals rely on PA in their MIL judgments when they have been primed with loneliness, which, makes an alternative source of meaning, namely belongingness, less accessible (Hicks et al. 2010).

Belongingness, or sense of relatedness to others, is itself widely researched as a source of meaning (Hicks and King 2009b; Lambert et al. 2013). Perceiving a sense of belonging has a positive impact on experienced MIL (Lambert et al. 2013), while feeling loneliness has a negative impact (Hicks and King 2009b; Stillman et al. 2009). In addition to being a key experience that gives rise to a sense of MIL, relatedness has been argued to be a "fundamental human motivation" (Baumeister and Leary 1995) and a basic psychological need with broad implications for different forms of well-being (Deci and Ryan 2000; Ryan 1995).

Yet relatedness is not the only theorized psychological need people exhibit. *Self-determination theory* (SDT; Deci and Ryan 2000; Ryan and Deci 2004) postulates three basic psychological needs, namely relatedness, autonomy, and competence, all of which are deemed essential to human wellness. Autonomy refers to a sense of volition and 'ownership' of one's own actions, while competence is about a sense of efficacy and mastery over one's actions. SDT has received very substantial empirical support, with the three psychological needs being consistently linked to a variety of well-being indices (e.g. Reis et al. 2000; Ryan et al. 2010). Theoretically, it has been suggested that these three needs should be important and independent predictors of MIL as well (see Weinstein et al. 2012), and correlational research has shown that all three needs are positively correlated with MIL (Hicks et al. 2012; Steger and Samman 2012). Some initial research has also connected autonomy (McGregor and Little 1998; Ryff 1989), and competence (Steger et al. 2008b; Stillman et al. 2009) to MIL. But the two studies that have included all three needs as control variables (their primary interest being something else) have produced differing results: Lambert et al. (2010) found that only competence predicted MIL when controlling for other variables, while Hicks et al. (2012) found that both competence, and relatedness predicted MIL. Hicks et al. (2012) also found that PA predicted MIL when controlling for the three needs, but don't report whether the three needs remained as significant predictors when PA was added to the model. Given these slightly contradictory findings, research that would offer a full analysis of autonomy, competence, and relatedness as simultaneous predictors of MIL would represent an important advancement of theory.

Finally, beneficence—one's sense of having a positive impact in the lives of other people (sometimes called prosocial impact)—has emerged as another important predictor of well-being (e.g. Aknin et al. 2013; Martela and Ryan 2016a). As regards beneficence and MIL, contributing towards something larger than oneself has sometimes been seen as almost a definitional part of a meaningful life (Frankl 1963; Wong 1989), and some research evidence has indeed shown how various forms of beneficence are connected to a greater sense of meaning (McGregor and Little 1998; Schnell 2011; Shek et al. 1994; Van Tongeren et al. 2016).

It has been suggested that human beings might be equipped with an inherent prosocial tendency that rewards us for benevolent acts (e.g. Brown and Brown 2006; Hepach et al. 2012). Recently, Martela and Ryan (2016b) showed in three studies that sense of beneficence is connected to subjective well-being even when controlling for the psychological needs for autonomy, competence, and relatedness, suggesting that experiences of beneficence represent a major source of wellness. This pattern of evidence makes it interesting to examine whether a sense of beneficence would be independently connected to meaning in life as well, when controlling for autonomy, competence, and relatedness, as well as positive affect. This would suggest that a significant source of meaning stems from acts of caring toward others.

From a theoretical standpoint, it is thus important to learn whether the relation between beneficence and MIL is direct, or could it be explained by increased relatedness or by PA arising from feeling useful. Yet research that directly looks at beneficence as a source of

MIL and compare it with other potential sources of meaning has thus far not been conducted.

2.1 The Relations Between SDT's Needs, Beneficence, Positive Affect, and Meaning in Life

As MIL has attained secure status as an important target for well-being research, it becomes vital to investigate the factors that may increase meaning in people's lives. Based on existing theory about the basic needs that humans need to fulfill in order to live their lives fully (Deci and Ryan 2000; Aknin et al. 2013; Martela and Ryan 2016b), we argue that autonomy, competence, relatedness, and beneficence are four central factors, the satisfaction of which should lead to a life experienced as meaningful. Many writers have argued that meaningfulness arises from connecting with other people and the wider world (Nozick 1981; Reker et al. 1987), and being dedicated to "a cause greater than oneself" (Frankl 1963, p. 17), and we see that relatedness, and beneficence satisfaction tap into these dimensions. Simultaneously, meaningfulness is often thought to be connected to doing activities that are self-chosen and congruent with one's personal valuing (Frankl 1963; Weinstein et al. 2012), and being effective in these activities (Baumeister 1991; Baumeister and Vohs 2002), and autonomy and competence satisfactions aim to capture these dimensions.

Indeed, prior research has shown that autonomy, competence, relatedness, and beneficence satisfactions can be empirically separated, and are all related to subjective well-being, independent of each other's influence (Martela and Ryan 2016b). However, no research has tested these relations with regard to MIL, nor has any research tested all four of these psychological satisfactions alongside PA. Therefore, the first aim of this research is to test whether autonomy, competence, relatedness, and beneficence emerge as predictors of MIL, independent of each other, as well as to assess whether such relations persist when PA is included in analyses.

A second, and more provocative, aim of this article is to more closely examine why there is a connection between PA and MIL. Self-determination theory has argued that autonomy, competence, and relatedness could be seen as experiential requirements of well-being (Deci and Ryan 2000) and thus would predict *both* PA (Ryan et al. 2010) and experienced MIL (Weinstein et al. 2012). Given that beneficence is also implicated in meaningful situations it too may help account for this connection of positivity to meaning. Therefore we hypothesize that these four satisfactions (beneficence and the needs for autonomy, competence, and relatedness) could fully account for the relations between PA and MIL. However, based on King et al's (2006), Heintzelman and King (2014b) mood-as-information perspective, a contrasting hypothesis could also be formulated: Satisfaction of the basic psychological needs and the satisfaction of being benevolent could lead to increased PA—as has been shown in numerous studies (e.g. Ryan et al. 2010)—which in turn could lead to increased sense of MIL. PA could thus also mediate the relations between these satisfactions and MIL (see Trent and King 2010). There is thus a need to properly examine the two contrasting hypotheses: Whether the proposed satisfactions could account for the relation between PA and MIL, or whether PA could account for the relation between these four satisfactions and MIL.

Thirdly, we also aim to advance research on different basic dimensions of MIL itself. A number of researchers have suggested that there would be three different dimensions of MIL (e.g. Heintzelman and King 2014a; King et al. 2006; Martela and Steger 2016; Steger 2012): The purpose dimension refers to highly personalized over-arching aspirations that guide behaviors toward valued long-term outcomes. The comprehension dimension refers

to people's ability to make sense of their experiences and integrate them into coherent mental representations. The significance dimension refers to people's judgments that living itself is worthwhile and valuable. Although these three components—comprehension, purpose, and significance—are thought to be theoretically distinct (Martela and Steger 2016), in terms of existing measurement, they are commonly conflated and to date have been assessed and used interchangeably. Especially research looking directly into significance dimension has been lacking (Martela and Steger 2016). The present study will provide one of the first studies that—alongside measures of general MIL—uses measures that tap directly into significance dimension of MIL.

3 Present Research

The first study in the present investigation will employ a cross-sectional survey to test autonomy, competence, relatedness, beneficence as well as PA as potential explanations of MIL to see which remain significant predictors when controlling for each other. The second study will complement these results by shifting from a whole-life perspective into a more episodic perspective of meaning (King and Hicks 2009), asking participants to evaluate a specific particularly meaningful situation using the same five potential predictors. In Study 3 we use a daily diary design to examine day-to-day variations in sense of meaning and whether such fluctuations among the five potential influences predict them. In this study, we also address causality by examining how PA and the four satisfactions influence MIL over a 2-week interval. In both studies 2 and 3, two distinct measures of meaning were used to broaden our understanding of which facets of meaning are influenced by the hypothesized factors. Together these three studies aim to assess how autonomy, competence, relatedness, beneficence, and PA together influence both general MIL as well as more situational and short-term meaning.

4 Study 1: General Survey

4.1 Method

4.1.1 Participants and Procedure

Participants completed a survey on Amazon Mechanical Turk in exchange for a small monetary compensation. Of the original 374 respondents, 332 were retained (88.8%; $M_{age} = 38$, *range* 18–76 years; 63% female) while 42 were omitted due to poor data quality (either answering the questionnaire in less than 5 min or obtaining too low a score on an inattention scale we included; Maniaci and Rogge 2013). The majority identified as Caucasian (73%), with 10% identifying as Asian, 7% as African American, 7% as Hispanic, 0.3% as Native American, and 3% preferring not to say.

4.1.2 Measures

4.1.2.1 Meaning in Life Meaning in life was assessed with Presence of Meaning Scale (Steger et al. 2006) that included five items (e.g. "My life has a clear sense of purpose.") evaluated on a scale from 1 (not at all true.) to 7 (very true). Reliability was $\alpha = .92$.

4.1.2.2 Positive Affect We used the Positive Affect Negative Affect Scale (PANAS: Watson et al. 1988) comprised of 10 items (e.g. "interested," "enthusiastic") using a scale from 1 (very slightly) to 5 (extremely). The reliability for the measure was $\alpha = .91$.

4.1.2.3 Need Satisfaction For satisfaction of the three needs for autonomy, competence, and relatedness, the satisfaction subscales of the *Basic Need Satisfaction and Frustration Scales* (Chen et al. 2015) was used. It included four items measuring satisfaction of each of SDT's three needs (e.g. "I feel my choices express who I really am" for autonomy, "I feel capable at what I do" for competence, and "I feel connected with people who care for me, and for whom I care" for relatedness) evaluated on scale from 1 (not at all true) to 7 (very true). Reliabilities were as follows: autonomy $\alpha = .82$, competence $\alpha = .90$, relatedness $\alpha = .87$.

4.1.2.4 Beneficence Satisfaction For satisfaction of beneficence, a four items measure from Martela and Ryan (2016b) was used (e.g. "I have been able to improve the welfare of other people", "In general, my influence in the lives of other people is positive") and evaluated on a scale from 1 (not at all true) to 7 (very true), with $\alpha = .83$.

4.2 Results

4.2.1 Preliminary Results

Table 1 presents means, standard deviations, and correlations of MIL, PA, autonomy, competence, relatedness, and beneficence. As can be seen, PA and MIL are significantly correlated (0.47), similarly MIL is correlated with all four proposed satisfactions, with correlations ranging from 0.55 to 0.71. PA is also correlated with all four satisfactions with correlations ranging from 0.43 to 0.55.

4.2.2 Primary Analysis

To test our first hypothesis, that all four satisfactions would independently predict MIL, a regression analysis was conducted. All four satisfactions were simultaneously entered as independent variables into a regression analysis with presence of meaning as dependent variable. The results ($F(4, 327) = 127$, $p < .001$, $R^2 = 0.61$) supported the hypothesis: autonomy ($\beta = 0.353$ [.250, .455], $p < 0.001$), competence ($\beta = 0.290$ [.191, .388],

Table 1 Means, standard deviations and zero-order correlations of study variables: Study 1

Measure	M	SD	1.	2.	3.	4.	5.	6.
1. Meaning	4.47	1.53	–	.47	.71	.68	.55	.64
2. Positive affect	3.14	.86		–	.52	.55	.43	.54
3. Autonomy	4.52	1.29			–	.68	.55	.65
4. Competence	5.05	1.31				–	.50	.63
5. Relatedness	5.22	1.27					–	.63
6. Beneficence	4.51	1.23						–

All correlations are significant at the $p < .05$ level or greater

$p < 0.001$), relatedness ($\beta = 0.106$ [.015, .197], $p < 0.03$), and beneficence ($\beta = 0.159$ [.056, .263], $p < 0.01$) all remained as significant predictors even when controlling for each other.

To test our second hypothesis that the four satisfactions would explain the relation between PA and MIL, a regression analysis was conducted with presence of meaning as dependent variable, and autonomy, competence, relatedness, beneficence, and PA as independent variables. Results ($F(5, 326) = 101$, $p < .001$, $R^2 = 0.61$) show that autonomy ($\beta = 0.354$ [.251, .457], $p < 0.001$), competence ($\beta = 0.293$ [.191, .394], $p < 0.001$), relatedness ($\beta = 0.107$ [.016, .198], $p < 0.03$), and beneficence ($\beta = 0.162$ [.056, .267], $p < 0.01$) all remained as significant predictors, and were virtually unchanged by the addition of PA to the model. PA itself ($\beta = -0.01$ [$-.097$, .077], $p = .82$) no longer predicted presence of meaning when controlling for these four satisfactions.

To investigate which of the four satisfactions are mainly responsible for explaining the relation between positive affect and meaning in life, we used PROCESS macro in SPSS (Hayes 2013; model 4) with meaning in life as the dependent variable, positive affect as the independent variable, and the four satisfactions as parallel mediators. The results showed that the paths from positive affect to autonomy ($\beta = .312$, SE $= .0281$, $p < .001$), competence ($\beta = .335$, SE $= .0277$, $p < .001$), relatedness ($\beta = .254$, SE $= .0292$, $p < .001$) and beneficence ($\beta = .307$, SE $= .0264$, $p < .001$) were all significant. And as shown already above, the paths from autonomy, competence, relatedness and beneficence to meaning were all significant. The direct path from positive affect to meaning became insignificant ($\beta = -.009$, SE $= .0391$, $p = .817$). The bootstrapping for indirect effects showed that the total indirect effect (CI 95% [.350, .504]) as well as the indirect effects through autonomy [.090, .237] competence [.082, .210], relatedness [.002, .084], and beneficence [.017, .137] were all significant.

4.3 Discussion

Autonomy, competence, relatedness, and beneficence satisfactions were all correlated with MIL, and remained significant independent predictors even when controlling for each other and for PA. Together, these four variables explained 61% of the total variance in MIL, supporting the idea that they are important elements contributing to meaning in life. When controlling for the four proposed satisfactions, PA was not a significant predictor. A mediation analysis showed that the relation between positive affect and meaning was simultaneously explained by all four satisfactions. Autonomy, competence, relatedness, and beneficence have been previously shown to predict PA (e.g. Aknin et al. 2013; Martela and Ryan 2016b; Ryan et al. 2010), so it could be the case that these four satisfactions predict both PA and MIL, and may explain the previously observed connection between these two.

5 Study 2: Situational Meaning

Study 2 involved two novel improvements that aimed to broaden understanding of the connections among MIL, PA, and the four proposed satisfactions. First, following other research pointing toward important differences between whole-life meaning and a more episodic perspective of meaning (e.g. King and Hicks 2009), the study focused on experiences of meaning within specific events. The aim was to see whether the same variables

influence both general meaning in life and meaning in specific situations. Secondly, meaning in life has been recently conceptualized to involve three facets: significance, purpose, and coherence (Martela and Steger 2016; Heintzelman and King 2014a; Steger 2012). Instead of looking at meaning as an indiscriminate construct, the present investigation included measures that tap directly into significance and purpose dimensions of meaning, thus making it possible to evaluate the influence of the proposed elements on them separately.

5.1 Method

5.1.1 Participants and Procedure

Participants again were recruited through Amazon Mechanical Turk. They were asked to recall "the single most personally meaningful event" from the last 2 weeks and describe it in a few sentences. Then they were asked to answer a number of questions asking them to think about how they felt during the event. From the original 231 respondents, 190 were retained (83%; $M_{age} = 36$, range 18–74 years; 56% female) and 41 were omitted because of poor data quality following the same procedures as in Study 1.

5.1.2 Measures

All measures described below were reworded from their original formats of evaluating one's life as a whole to instead refer to one's feelings and opinions in specific situations respondents were instructed to recall.

5.1.2.1 Meaning in Life Two different measures of MIL were used. First, meaning as significance was measured with the valued life sub-scale of the Meaningful Life Measure developed by Morgan and Farsides (2009). It involves four questions (e.g. "During this event my life felt significant"), rated on a scale from 1 (not at all true) to 7 (very true). Second, a scale assessing purpose in life was developed specifically for present study, partially using items from Morgan and Farsides (2009) and Sheldon et al. (2001). It was comprised of three questions ("During this event I felt a sense of deeper purpose in my life"; "During this event I felt I was contributing towards goals that are important to me"; "During this event I had very clear goals and aims") answered on a scale from 1 (not at all true) to 7 (very true). The reliability for the purpose in life measure was $\alpha = .73$, and for significant life it was $\alpha = 92$.

5.1.2.2 Positive Affect As in Study 1 we used the 10 item PANAS (Watson et al. 1988), this time asking participants to evaluate how much they felt these feelings and emotions during the event. Reliability was $\alpha = .87$.

5.1.2.3 Need Satisfaction Satisfaction of the needs for autonomy, competence, and relatedness were measured with 3 items each taken from (Sheldon et al. 2001), evaluated on scale from 1 (not at all true) to 7 (very true) with the prefix "During this event…" Examples include "I felt free to do things my own way" for autonomy, "very capable in what I did" for competence, and "a strong sense of intimacy with the people I spent time with" for relatedness. Reliabilities were: autonomy $\alpha = .77$, competence $\alpha = .74$, relatedness $\alpha = .89$,

5.1.2.4 Beneficence Satisfaction This was assessed with 3 items from the same scale used in Study 1 Reliability in this sample was $\alpha = .83$.

5.2 Results and Discussion

5.2.1 Preliminary Results

Table 2 presents means, standard deviations, and zero-order correlations of the MIL measures, PA, and autonomy, competence, relatedness, and beneficence. Replicating results from Study 1, PA as well as autonomy, competence, relatedness, and beneficence were all positively correlated with MIL. Further, autonomy, competence, relatedness, and beneficence were also positively correlated with PA and each other.

5.2.2 Primary Analysis

The first hypothesis of this study was that autonomy, competence, relatedness, and beneficence satisfactions would be independent contributors towards MIL. To test this, two regression analyses were conducted with the four predictors as independent variables, and with purpose in life and significant life, respectively, as dependent variables. Autonomy ($\beta = 0.278$ [.165, 390], $p < .001$), competence ($\beta = 0.357$ [.255, .459], $p < .001$), relatedness ($\beta = 0.120$ [.019, .222], $p = .021$), and beneficence ($\beta = 0.307$ [.202, .411], $p < .001$) all emerged as significant independent predictors of purpose in life ($F(4, 184) = 108$, $p < .001$, $R^2 = 0.70$). Autonomy ($\beta = 0.261$ [.131, .391], $p < 0.001$), competence ($\beta = 0.154$ [.035, .272], $p < 0.02$), relatedness ($\beta = 0.330$ [.212, .448], $p < .001$), and beneficence ($\beta = 0.245$ [.123, .366], $p < 0.001$) also were independent predictors of significant life ($F(4, 184) = 68$, $p < .001$, $R^2 = 0.60$).

To examine the relation of PA and MIL, two further regression analyses were conducted with, again, purpose in life and significant life as respective dependent variables, and with autonomy, competence, relatedness, beneficence, and PA as independent variables. The results for purpose in life ($F(5, 183) = 95$, $p < .001$, $R^2 = 0.72$), showed that autonomy ($\beta = 0.221$ [.109, .333], $p < .001$), competence ($\beta = 0.330$ [.231, 429], $p < .001$), relatedness ($\beta = 0.107$ [.008, .205], $p = .034$), beneficence ($\beta = 0.269$ [.166, .372], $p < .001$), and PA ($\beta = 0.184$ [.088, .280], $p < .001$) all emerged as independent predictors of MIL. To assess whether the four proposed satisfactions could be acting as confounding factors behind the correlation between PA and purpose in life, the standardized coefficient of PA alone on purpose in life was calculated ($\beta = 0.609$ [.494, .723], $p < .001$). The difference in coefficients was significant (0.184 vs. 0.609, $p < .01$), which shows that although the

Table 2 Means, standard deviations, and zero-order correlations of study variables: Study 2

	M	SD	1.	2.	3.	4.	5.	6.	7.
1. Valued life	5.40	1.57	–	.75	.63	.64	.47	.62	.62
2. Purpose	4.98	1.57		–	.61	.70	.67	.49	.67
3. Positive affect	3.40	.90			–	.54	.43	.36	.47
4. Autonomy	5.05	1.48				–	.57	.50	.52
5. Competence	4.44	1.61					–	.18	.45
6. Relatedness	5.30	1.80						–	.53
7. Beneficence	4.31	1.84							–

All correlations significant at the level .05 or more

four satisfactions did not explain all the correlation between the two variables, they explained a significant part of that variance.

The results with significant life as dependent variable were largely similar ($F(5, 183) = 68$, $p < .001$, $R^2 = 0.65$). Once again, autonomy ($\beta = 0.173$ [.047, .299], $p = .008$), relatedness ($\beta = 0.308$ [.198, .419], $p < .001$), beneficence ($\beta = 0.186$ [.070, .301], $p = .002$), and PA ($\beta = 0.288$ [.181, .395], $p < .001$) all emerged as significant independent predictors of MIL. The coefficient for competence closely approached significance ($\beta = 0.111$ [$-.0004$, .223], $p = .0509$). Again, a comparison of coefficients of PA when regressed alone ($\beta = 0.627$ [.515, .740], $p < .001$) and when control variables were included ($\beta = 0.288$ [.181, .395], $p < .001$) showed that the difference was significant ($p < .01$), indicating that the autonomy, competence, relatedness and beneficence satisfactions together explained a substantial part of the relation between PA and MIL.

5.3 Discussion

Corroborating Study 1, this study showed that autonomy, competence, relatedness, and beneficence emerged as independent predictors of two different measures of meaning in life. Together, these four satisfactions explained a significant part of variance in both significant life (60%) and purpose in life (70%). Furthermore, these results remained the same even when controlling for PA. The exception was competence as a predictor of significant life, although this relation approached significance ($p = 0.051$).

Unlike in Study 1, PA remained a significant predictor of both measures of meaning, even when controlling for the four satisfactions. In meaningful situations, PA thus seems to contribute experienced meaningfulness alongside the influences of autonomy, competence, relatedness, and beneficence. It could be that positive emotions themselves are a source of situational meaning, or that PA acts as a proxy for still yet unaccounted sources of meaning (cf. Hicks et al. 2010). It also could be that PA serves as a memory or selection cue for the recall of meaningful and positive events (e.g. falling in love) rather than meaningful but negative events (e.g. losing a loved one). Nevertheless, the standardized coefficient of PA was significantly smaller when the four satisfactions for meaning were controlled, indicating that at least part of the relation between PA and situational meaning is accounted for by these four specific satisfactions.

6 Study 3: Daily Diary Study

In studies 1 and 2 we investigated how PA connects with general MIL and situational meaning, as well as the role of basic psychological needs and beneficence. To further investigate these relations, we conducted a daily diary study to assess whether changes in PA and daily satisfaction of autonomy, competence, relatedness and beneficence would predict fluctuations in daily sense of meaningfulness. A number of studies have looked at meaningfulness utilizing a daily diary method (Kashdan and Steger 2007; King et al. 2006 Study 2; Steger et al. 2006; 2008a, b; Steger and Kashdan 2013), which make it possible to look at what causes daily fluctuations in meaningfulness judgments. In this study, we tested daily levels of autonomy, competence, relatedness, beneficence and PA as predictors of meaningfulness. Furthermore, pre- and post-surveys made it possible to also conduct a brief longitudinal analysis to examine causality.

6.1 Method

6.1.1 Participants and Procedure

Eighty-nine students (M_{age} = 19.9, *range* 18–24 years; 66% female) at a northeastern U.S. university participated by registering to an online system in exchange for extra credit. Participation was voluntary and participants had the choice of selecting this study among many others. Four participants' results were omitted from the final analysis, either because they answered less than 7 of the daily surveys or because of poor data quality (e.g. repeated answers). Thus the final sample size was 85. Three days before the study at Time 1 (T1), participants filled out an online pre-study survey, which evaluated their basic psychological need and beneficence satisfactions on a trait level. After that, on 10 consecutive days, participants were given the survey link through email at 6 PM and asked to complete it before the end of the day. The survey included questions about well-being, meaning, and need satisfaction during that particular day. The day after the daily surveys (14 days after T1), the participants filled a post-study survey with identical measures as in the pre-study survey.

6.1.2 Measures

6.1.2.1 Trait-Level Measures These measures were collected both in the pre-study and the post-study, and the pre-study measures were used as control variables in the daily analyses.

6.1.2.2 Need Satisfaction For satisfaction of the three needs for autonomy, competence, and relatedness, we used the same Basic Need Satisfaction and Frustration Scales, again as in Study 1 using only the satisfaction items (Chen et al. 2015). The reliabilities for these measures in the pre-study were: autonomy α = .86, competence α = .90, relatedness α = .82.

6.1.2.3 Beneficence Satisfaction To assess beneficence satisfaction we used the same four-item scale from Study 1, (α = .84).

6.1.2.4 Meaning in Life Meaning in life was assessed with two different scales. Presence of Meaning Scale (Steger et al. 2006) assessed general sense of MIL and included five items (e.g. "My life has a clear sense of purpose.") evaluated on a scale from 1 (not at all true.) to 7 (very true). The reliability of this measure was α = .86 at T1 and .85 at T2. Significance in life was measured with six face-valid items generated for this study (e.g. "I feel that what I do in life is worthwhile" and "My life feels significant") that were rated on a scale from 1 (*not at all true*) to 7 (*very true*). Cronbach's alphas for significant life were at T1 .90 and at T2 .88.

6.1.2.5 Positive Affect As in Study 1 we used the 10 item PANAS (Watson et al. 1988) using a scale from 1 (very slightly) to 5 (extremely). Cronbach's alphas for PA were .91 for T1 and .93 for T2.

6.1.2.6 Day-Level Measures These measures were collected from participants on each of the 10 days and reflect experiences throughout that day.

6.1.2.7 Meaning Daily meaning was assessed using two different measures. First, general sense of meaningfulness was assessed using the *Subjective Meaningfulness of the Day* scale from King and Hicks (2009). It was comprised of two items: "This day was very meaningful to me" and "Today, I felt that my life had a clear sense of purpose," rated from 1 (not at all true) to 7 (very true). To assess *sense of significance*, we used three items that were partially based on the valued life sub-scale of Morgan and Farsides (2009), but adapted to assess daily meaning: "Today, I felt that life is truly worth living", "This was a very significant day to me", and "The things I did today felt worthwhile." They were assessed on a scale from 1 (not at all true) to 7 (very true). Alpha for meaningfulness was .84 and for significance was .85.

6.1.2.8 Need Satisfaction Autonomy, competence, and relatedness satisfactions were measured with the Balanced Measure of Psychological Needs (BMPN; Sheldon and Hilpert 2012). Each need was measured with three items (e.g. "I was free to do things my own way" for autonomy, "I took on and mastered hard challenges" for competence, and "I felt close and connected with other people who are important to me" for relatedness) rated on scale from 1 (not at all true) to 7 (very true). Reliabilities were: autonomy $\alpha = .84$, competence $\alpha = .90$, relatedness $\alpha = .92$.

6.1.2.9 Beneficence Beneficence satisfaction was assessed with three of the four items used in Study 1, rated on a scale from 1 (not at all true) to 7 (very true); ($\alpha = .91$).

6.1.2.10 Positive Affect To measure positive affect we used the positive emotions from the Daily Positive and Negative Emotions scale (Diener and Emmons 1984), which included four emotional items (happy, pleased, enjoyment/fun, and joyful) and asked participants to rate how much they experienced that emotion on that day, rated on a scale from 1 (not at all) to 7 (very much). The reliability was $\alpha = .92$.

6.2 Results

6.2.1 Primary Analysis

6.2.1.1 Plan of Analysis A multi-level modeling approach was adapted (Bryk and Raudenbush 1992; Quené and van den Bergh 2004) to account for multiple time points nested within persons. This made it possible to consider day-level data (Level 1) nested within person-level data (Level 2). Based on the recommendations of Bryk and Raudenbush (1992), all day-level variables were centered on the individuals' means to represent daily deviations from person's mean experiences. Similarly, all person-level variables were centered on sample means, to represent the relative standing of the individual within the group.

In the first stage, an unconditional model was tested to assess intraclass correlation (ICC). This allowed us to see whether there was sufficient within-person variance in the data to continue the analysis. In the second stage, a model was constructed to test the effects of daily need satisfaction on the two indicators of meaning in life: meaning and significance. Control variables were added to a third model. These included trait-level psychological need and beneficence satisfactions, gender, and whether it was weekend or not, to account for the fact that well-being has been shown to vary systematically between weekdays and weekend (Ryan et al. 2010). A first-order autoregressive covariance

structure for Level 1 residuals was chosen (Goldstein et al. 1994), to control for auto-correlations in the longitudinal data (Marco and Suls 1993; Reis et al. 2000). This covariance structure treats observations that are closer in time as more highly correlated than observations further apart. Following Sadikaj et al (2011), this model was compared to a random-intercept model that assumes no covariance between observations. The deviance test statistic showed that the first-order autoregressive covariance structure had better fit and accordingly it was adopted for the primary analysis.

6.2.2 The Effects of Daily Need Satisfaction on Experienced Meaningfulness

6.2.2.1 Meaningfulness Results from the base-line ICC model showed that 51.2% of the variance in meaningfulness was at the within-person level, and 48.8% at the between-persons level. The primary results are shown in Table 3 for the third model that included the control variables. As regards the four satisfactions, the results supported the hypothesis that they all would predict daily fluctuations in meaningfulness, even when daily PA, gender, weekend-effect, and trait-level need and beneficence satisfactions were controlled for. Daily levels of autonomy predicted daily changes in PA ($\beta = .213$ [.153, .274], $p < .001$), and similar results were obtained for competence ($\beta = .113$ [.072, .154], $p < .001$), relatedness ($\beta = .078$ [.029, .126], $p < .01$), and beneficence ($\beta = .122$ [.073, 171], $p < .001$). As gender emerged also as a significant predictor with men experiencing more meaningfulness than women, we tested for interaction effects between the four day-level satisfactions and gender. None of these interaction effects emerged as significant. Among trait-level measures of satisfaction, both autonomy and beneficence emerged as significant positive predictors, above and beyond daily levels of those same satisfactions. Although this result was not predicted, it seems to show that trait-level autonomy and beneficence can influence one's daily sense of meaningfulness. PA also was a significant predictor of daily changes in meaningfulness ($\beta = .103$ [.066, .140], $p < .001$), even controlling for the four satisfactions on both daily and trait level, as well as gender and weekend. Results thus show that daily changes in autonomy, competence, relatedness, beneficence, and PA all emerged as significant and independent predictors of daily changes in meaningfulness.

Table 3 Results from multiple level model that included all control variables

Variable	Meaning		Significance	
	β	*p*	β	*p*
Daily autonomy	.213	<.001	.319	<.001
Daily competence	.113	<.001	.181	<.001
Daily relatedness	.078	.002	.191	<.001
Daily beneficence	.122	<.001	.192	<.001
Daily positive affect	.103	<.001	.116	<.001
Gender	.637	.041	.282	.489
Weekend	.036	.805	.196	.289
Trait-level autonomy	.124	.017	.183	.008
Trait-level competence	.064	.183	.100	.115
Trait-level relatedness	−.097	.062	−.160	.020
Trait-level beneficence	.274	<.001	.386	<.001

6.2.2.2 Significance Of the variance in significance, 55.0% was at the within-person level, and 45.0% at the between-persons level. The primary results are shown in Table 3. Analogous to above results, daily satisfaction of all four satisfactions predicted daily fluctuations in significance, even when controlling for each other and for PA, gender, weekend-effect, and trait-level satisfactions. Daily autonomy predicted increased significance ($\beta = .319$ [.242, .396], $p < .001$), and similar results were obtained for competence ($\beta = .181$ [.129, .233], $p < .001$), relatedness ($\beta = .191$ [.129, 253], $p < .001$), and beneficence ($\beta = .192$ [.130, .254], $p = .001$). Furthermore, trait-level autonomy, relatedness and beneficence emerged as significant predictors of daily fluctuations of meaning (see Table 3). Daily PA also predicted daily significance ($\beta = .116$ [.069, .163], $p = .001$), even when controlling for all four satisfactions on both daily and trait-levels, and for gender and weekend-effect. Together these results thus identified five independent predictors of daily fluctuations in sense of significance: autonomy, competence, relatedness, beneficence, and PA.

6.2.2.3 Causal Analysis The fact that we collected trait-level measures of MIL, PA, beneficence and need satisfaction both in the pre-study (T1) and post-study survey (T2) allowed us also to make an inference into causality, by looking whether T1 PA and our four satisfaction variables would predict T2 MIL, when controlling for T1 MIL. To assess this, we calculated regression analyses separately for general MIL and significant life. However, given the small sample size and expected levels of effect sizes, we were skeptical about the possibility to detect five separate effects on meaning. As the primary interest was to contrast PA with the four satisfactions, we decided to combine the scores on four different satisfactions to come up with one composite measure for overall psychological satisfaction. Previous research on need satisfaction and MIL have used such composite measure of need satisfaction that combines autonomy, competence, and relatedness (Eakman 2013; Schlegel et al. 2009), but here we also used beneficence scores, which have been found to be positively correlated with the three psychological needs (in this study in the range .51–.69; see also Martela and Ryan 2016b). The reliabilities for combined need satisfaction were indeed high .93 at T1 and .95 at T2, supporting the combination.

First, we used T2 general MIL as dependent variable, and T1 MIL as control variable. When T1 PA was entered as predictor ($F(2, 76) = 37$, $p < .001$, $R^2 = 0.49$), it did not emerge as significant predictor ($\beta = .078$ [−.113, .270], $p = .42$). However, when T1 combined satisfaction was entered as predictor ($F(2, 76) = 41$, $p < .001$, $R^2 = 0.52$), it was a significant predictor ($\beta = .247$ [.027, .468], $p = .028$). When both T1 combined satisfaction and T1 PA were entered simultaneously as predictors and T1 meaning as control variable ($F(3, 75) = 27$, $p < .001$, $R^2 = 0.52$), PA was not a significant predictor ($\beta = .0031$ [−.198, .205], $p = .98$), while combined satisfaction was ($\beta = .246$ [.008, .484], $p = .043$).

Using T2 significance in life as dependent variable, and T1 significant life as control variable, similar results were obtained. When PA was alone entered as predictor ($F(2, 76) = 37$, $p < .001$, $R^2 = 0.50$), it did not emerge as significant ($\beta = .028$ [−.167, 222], $p = .78$). When T1 combined satisfaction was used as predictor ($F(2, 76) = 41$, $p < .001$, $R^2 = 0.52$), it emerged as significant ($\beta = .287$ [.010, .562], $p = .042$). When both T1 PA and T1 combined satisfaction scores were entered simultaneously as predictors ($F(3, 75) = 27$, $p < .001$, $R^2 = 0.52$), PA at T1 did not predict significant life at T2 ($\beta = −.031$

[−.229, .168], $p = .76$), but combined satisfaction was a significant predictor ($\beta = .299$ [.009, .589], $p = .043$).

As a further small-scale longitudinal analysis, we took the daily diary data to look at whether previous day's satisfactions and positive affect would predict next day's meaningfulness. For this we used a regression analysis where T1 general MIL was the dependent variable and T0 (previous day's) autonomy, competence, relatedness, beneficence, positive affect, and general MIL were the independent variables. When controlling for previous day's general MIL ($\beta = .504$ [.402, .617], $p < .001$), only previous day's positive affect ($\beta = .104$ [.003, .116], $p = .040$) was a significant predictor of meaning in life (for four satisfactions, p's > .20). However, repeating the same procedure using T1 significance as the dependent variable and controlling for T0 significance ($\beta = .400$ [.279, .515], $p < .001$), only T0 autonomy ($\beta = .103$ [.005, .229], $p = .040$) significantly predicted T1 significance (for other three satisfactions and PA, p's > .150). It thus seems that previous day's positive affect can predict next day's general meaningfulness, while previous day's autonomy can predict next day's significance.

6.3 Discussion

This study added to the results of studies 1 and 2 by showing that daily changes in the four target psychological satisfactions also significantly predicted daily changes in meaningfulness. This result was obtained when using both a general measure of meaningfulness and an *ad hoc* assessment of significant life. Further, these results remained significant when controlling for PA, trait-level satisfactions, weekend effect, and gender. This study thus provided robust evidence that these four satisfactions indeed contribute to a sense of meaningfulness.

The present results also showed that daily changes in PA were a significant predictor of daily changes in meaningfulness, even when controlling for both trait- and daily levels of the psychological satisfactions as well as gender and weekend-effect. These results were obtained using two different measures of meaning.

As regards causality, results for both MIL and significant life were identical: PA at T1 did not emerge as significant predictor of T2 meaningfulness, both when controlling for T1 satisfactions, and when not controlling for them. However, T1 satisfaction was a significant and positive predictor of T2 MIL using both measures of meaning and both when controlling for T1 PA and when not controlling for it. When we looked at the daily diary data to see whether previous day's satisfactions or positive affect would predict next day's meaningfulness, it turned out that PA predicted next day's general MIL while autonomy predicted next day's significance. However, as these were post hoc analyses not anticipated when designing the study, the results should be confirmed with further research. Nevertheless, it is interesting to note the difference between predictors of significance and general meaningfulness in this study.

7 General Discussion

In these three studies we examined four psychological satisfactions expected to underlie people's experience of meaning, both as direct predictors and as potential mediators of positive affect, which has recently been proposed to predict meaning in its own right. Results demonstrated that the four elements of meaning together explained substantial

variance in MIL, measured with different instruments and both generally, event-specifically and on a daily level. In addition in some contexts they fully accounted for the effects of PA, though interestingly, not in all.

More specifically, Study 1 demonstrated using cross-sectional data that satisfaction of autonomy, competence, relatedness and beneficence all emerged as separate predictors of MIL, and together accounted for 61% of variance in MIL. Furthermore, when PA was added as a predictor, all four satisfactions remained significant predictors, but PA did not.

The second study asked participants to think about their experience during the single most meaningful event from the last 2 weeks. Once again, the four proposed psychological satisfactions emerged as significant and separate predictors, together accounting for 70% of variance in purpose in life, and 60% of variance in significant life. This result thus replicated the findings of Study 1 on a different time scale and utilizing two different scales for MIL. Yet in contrast to Study 1, when PA was added as a predictor, all five predictors (PA and the four satisfactions) emerged as significant predictors, even when controlling for each other.

Study 3 looked at how the four proposed satisfactions influenced daily fluctuations in meaning over a 10-day span. Once again, all four emerged as independent predictors of daily changes in both meaningfulness and a sense of significance. PA also emerged as an independent predictor of daily changes in both measures. Studies 2 and 3 thus showed that in looking at momentary and short-term meaningfulness, autonomy, relatedness, competence, beneficence *and* PA all have independent predictive power. Furthermore, Study 3 used the pre-study (T1) and post-study surveys (T2) that had 14 days between them to look at a specific causal effect. The results showed that while combined measure of satisfaction at T1 predicted changes in both MIL and significance in life at T2, PA did not emerge as a significant predictor. These results were thus more in line with the findings of Study 1. As regards daily fluctuations in meaning and how they could predict next day's meaningfulness, it turned out that PA predicted next day's MIL while autonomy predicted next day's significance.

Together, these three studies make several contributions to research on meaning in life. Firstly, based on theory we proposed that autonomy, competence, relatedness, and beneficence would be the key elements explaining what makes life meaningful. Across all three studies that used varied time periods and methods it was demonstrated that these four satisfactions were independently associated with both general sense of MIL as well as daily fluctuations in meaningfulness and meaningfulness of peak experiences. Together, they accounted for 60–70% of variance in meaning in life across various measures. In addition to meaning in life literature, this finding is valuable for research on self-determination theory, where it has been previously suggested (Weinstein et al. 2012), but not empirically tested, that autonomy, competence, and relatedness would predict MIL.

Second, we contribute to research examining the link between PA and MIL (e.g. King et al. 2006) by showing that when certain factors are controlled for, they might not always be connected. The implications of this finding will be discussed below in more detail. Third, the present studies provided further evidence for suggesting that people use somewhat different cues in assessing meaning of their lives and meaningful moments. In the future, more research would be needed to further separate general meaning in life from the meaningfulness of more short-term situations.

Furthermore, it has been recently suggested that the general sense of meaning could be divided into three facets: purpose, coherence, and significance (Martela and Steger 2016). However, empirical investigations that would separate these three facets have been scarce (George and Park 2013). The present research contributes to the literature on MIL by

utilizing—in addition to measures of general sense of meaningfulness—more specific measures that tap into some of these proposed key facets of meaningfulness. More specifically, while Study 1 used a general measure of MIL, Study 2 used separate measures for purpose and significance, and Study 3 included a measure of general sense of meaningfulness as well as a measure of significance. In the future, theory on MIL would benefit from more research that would show how different facets of meaning are distinct, and how they are connected to a general sense of MIL.

7.1 The Connection Between Positive Affect and Meaning in Life

Examining the relations between positive affect and meaning in life is relevant for discussions that want to distinguish between 'hedonic' and 'eudaimonic' types of well-being, which often take the former as a dimension of hedonic well-being, and the latter as a dimension of eudaimonic well-being (Waterman 1993; Ryan and Deci 2001; Delle Fave et al. 2011). Although previous research has shown that experimentally manipulated PA leads to increased sense of MIL (King et al. 2006, Study 5), the present study provided more mixed evidence for the role of PA in meaning. Daily sense of meaning indeed was connected to PA, but general sense of meaning was not, when controlling for the four satisfactions of autonomy, competence, relatedness and beneficence. How to account for this discrepancy?

One explanation for the discrepancy between the present results and previous research could be simply about the measures used. Lambert et al. (2010) who didn't find all three needs as predictors of MIL, and Hicks et al. (2012) who found that PA predicted MIL also after controlling for the three needs, both used Krause's (2004, 2007) eight item measure that is divided into the sub-dimensions of personal values, purpose in life, life goals, and reconciliation of the past. This differs from the present research, which didn't measure values or reconciliation as part of MIL but concentrated on purpose, significance and general sense of meaningfulness. Thus it could be that the three needs are more predictive of MIL as measured in the present study as compared to Krause's conceptualization of MIL.

As regards general sense of MIL and PA, already some previous research has shown that PA is not always relevant to MIL judgments. The longitudinal study spanning 2 years by King et al. (2006, Study 3) failed to find a link between PA and MIL. Furthermore, there are moderation effects in the literature for the PA to meaning relation. For example, highly religious people report high MIL regardless of PA (Hicks and King 2008) and induced positive mood increased MIL judgments, but only for people high in assessed loneliness (Hicks and King 2009b, Study 2). One explanation provided by Hicks and King (2009a) for these findings is the mood-as-information effect (Schwarz 2001). In making judgments about abstract life domains, rather than consulting all declarative information available, people may rely on mood to provide a quick answer. Accordingly, Hicks and King (2009a, p. 646) predict that "while PA is often a strong predictor of judgments of meaning in life, other more central variables may supersede mood as information." The present study may indeed have identified such more central variables by looking at SDT's basic need constructs and the construct of beneficence. Therefore, as regards general MIL, the present studies support the idea that affect is easily accessible information people use as a heuristic to make judgments about their life's meaningfulness. When more relevant cues are available or empirically controlled for, the connection between MIL and PA can be "wiped out" (Hicks and King 2009a, p. 646).

At the same time, the present research shows that with regard to more short-term judgments about meaningfulness (i.e., daily meaningfulness and meaningfulness of particular events) PA is connected to meaningfulness, even when the four satisfactions are

controlled. There are (at least) two ways to explain these findings. First, there could be some other, yet unidentified factors, that influence our short-term judgments of meaningfulness, of which PA works as a cue. Yet, one could also argue that in assessing the meaningfulness of these short-term experiences, PA is not just information about other factors, but actual factor of how meaningful a certain experience is judged to be. For example, Lambert et al. (2010) found that when people were asked to rate different sources of meaning, 'happiness' emerged as second in highest ranked sources.

It thus could be that when we judge events and daily experiences, the amount of PA we experienced might be one factor we take into account when deciding that an experience is meaningful. When we judge the meaningfulness of our lives as a whole, PA might be less relevant. An interesting question for future research might be what *kinds* of PAs are relevant for experiences of meaningfulness. For example, Hicks and King (2009a, p. 645) suggest that certain feelings like zest or vitality might be especially relevant for our sense of meaningfulness.

7.2 Limitations and Future Research Directions

These studies have certain limitations that have to be taken into account when interpreting the results. Except for the longitudinal investigation in Study 3, these studies utilized cross-sectional data or data on daily variance, which do not allow one to make direct inferences about causality. Thus it would be interesting to see future studies that experimentally manipulate the experience of the basic need and beneficence satisfactions. In addition, it would be interesting to see studies that would look at people's goals in life to see whether goals related to the four proposed satisfactions would predict future MIL (cf. Niemiec et al. 2009). It is also worth noting that previous research has shown that the strength of the relation between MIL and subjective well-being can vary depending on certain environmental factors such as how hostile the participants experienced their world to be (Shrira et al. 2011), and thus it would be interesting to look at the influence of such environmental factors on the presently identified connections.

The sample in Study 3 consisted solely of college students, so one should be careful when generalizing the results to other populations. Studies 1 and 2, in turn, used an internet sample from Amazon Mechanical Turk, which is also a selective population with certain limitations, even though it has been shown to be more representative of the general population than using college samples (see Buhrmester et al. 2011). A further limitation is that all the data was gathered from US participants, which makes cross-cultural generalizations speculative. Autonomy, competence, relatedness (e.g. Chen et al. 2015) and beneficence (Aknin et al. 2013) have all been shown to influence well-being cross-culturally, but future studies should establish whether they similarly influence MIL across varied cultures. It is also worth noting that this study, and research on MIL more generally, is based on self-reports, which are susceptible to biases such as social desirability (Paulhus 1991). Accordingly, it could be beneficial to control for social desirability tendencies in future studies.

8 Conclusion

The quest for meaning has been suggested to be a fundamental part of our psychological make-up (Baumeister 1991; Frankl 1963; Wong 1989). Indeed, attainment of MIL has been linked to various positive outcomes (see e.g. Steger et al. 2009; 2011). Yet in order to

successfully search for meaning, one has to know where to look for it. Therefore, we need investigations into the elements that make life meaningful. In our current age of materialism (Twenge and Kasser 2013) it is especially crucial to find scientifically backed up claims about what makes life meaningful.

The present article points the way toward such an understanding by giving empirically supported arguments for the existence of four satisfactions underlying a sense of meaning: autonomy, competence, relatedness and beneficence. Previous research has already shown the importance of these four dimensions for subjective well-being and vitality (Martela and Ryan 2016b). Thus, if we understand eudaimonia as a manner of living that most reliably leads to human thriving (Ryan and Martela 2016), it could be argued that ways of living that lead to the satisfaction of these four dimensions might be especially good candidates for what a eudaimonic way of living would involve (Ryan and Martela 2016) More research, especially experimental studies, is needed, but the theory of four satisfactions leading to meaning in life seems promising and merits further research interest. We argue that by finding ways to fulfill these four satisfactions in one's life, an individual can experience more meaning. While it has been argued that happiness as a goal can be counterproductive (Gruber et al. 2011), pursuing goals related to these satisfactions might be more promising. In addition, satisfaction of SDT's three basic needs has previously been shown to mediate the relations between intrinsic goals and wellness (e.g. Niemiec et al. 2009). When an individual is able to find ways of self-expression through satisfaction of autonomy and competence, and self-transcendence through satisfaction of relatedness and beneficence, then that life should be filled with meaning and truly a life worth living.

References

Aknin, L. B., Barrington-Leigh, C. P., Dunn, E. W., Helliwell, J. F., Burns, J., Biswas-Diener, R., et al. (2013). Prosocial spending and well-being: Cross-cultural evidence for a psychological universal. *Journal of Personality and Social Psychology, 104*(4), 635–652.

Baumeister, R. F. (1991). *Meanings of life*. New York: The Guilford Press.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*(3), 497–529.

Baumeister, R. F., & Vohs, K. D. (2002). The pursuit of meaningfulness in life. In C. R. Snyder & S. J. Lopez (Eds.), *Handbook of positive psychology* (pp. 608–618). New York: Oxford University Press.

Baumeister, R. F., Vohs, K., Aaker, J., & Garbinsky, E. (2013). Some key differences between a happy life and a meaningful life. *Journal of Positive Psychology, 8*(8), 505–516.

Brown, S. L., & Brown, R. M. (2006). Selective investment theory: Recasting the functional significance of close relationships. *Psychological Inquiry, 17*(1), 1–29.

Bryk, A. S., & Raudenbush, S. (1992). *Hierarchical linear models: Applications and data analysis methods*. Newbury Park, CA: Sage.

Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's mechanical turk a new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science, 6*(1), 3–5.

Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E. L., der Kapp-Deeder, J., et al. (2015). Psychological need satisfaction, need frustration, and need strength across four cultures. *Motivation and Emotion, 39,* 216–236.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268.

Delle Fave, A., Brdar, I., Freire, T., Vella-Brodrick, D. A., & Wissing, M. P. (2011). The eudaimonic and hedonic components of happiness: Qualitative and quantitative findings | SpringerLink. *Social Indicators Research, 100*, 185–207.

Diener, E., & Emmons, R. A. (1984). The independence of positive and negative affect. *Journal of Personality and Social Psychology, 47*(5), 1105–1117.

Diener, E., Suh, E., Lucas, R., & Smith, H. (1999). Subjective well-being: Three decades of progress. *Psychological Bulletin, 125*(2), 276–302.

Eakman, A. M. (2013). Relationships between meaningful activity, basic psychological needs, and meaning in life: Test of the meaningful activity and life meaning model. *OTJR-Occupation Participation and Health, 33*(2), 100–109.

Frankl, V. E. (1963). *Man's search for meaning: An introduction to logotherapy.* New York: Washington Square Press.

George, L. S., & Park, C. L. (2013). Are meaning and purpose distinct? An examination of correlates and predictors. *The Journal of Positive Psychology, 8*(5), 365–375.

Goldstein, H., Healy, M. J., & Rasbash, J. (1994). Multilevel time series models with applications to repeated measures data. *Statistics in Medicine, 13*(16), 1643–1655.

Gruber, J., Mauss, I. B., & Tamir, M. (2011). A dark side of happiness? How, when, and why happiness is not always good. *Perspectives on Psychological Science, 6*(3), 222–233.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach.* New York: Guilford Press.

Heintzelman, S. J., & King, L. A. (2014a). Life is pretty meaningful. *American Psychologist, 69*(6), 561–574.

Heintzelman, S. J., & King, L. A. (2014b). (The feeling of) meaning-as-information. *Personality and Social Psychology Review, 18*(2), 153–167.

Hepach, R., Vaish, A., & Tomasello, M. (2012). Young children are intrinsically motivated to see others helped. *Psychological Science, 23*(9), 967–972.

Hicks, J. A., & King, L. A. (2008). Religious commitment and positive mood as information about meaning in life. *Journal of Research in Personality, 42*(1), 43–57.

Hicks, J. A., & King, L. A. (2009a). Meaning in life as a subjective judgment and a lived experience. *Social and Personality Psychology Compass, 3*(4), 638–653.

Hicks, J. A., & King, L. A. (2009b). Positive mood and social relatedness as information about meaning in life. *The Journal of Positive Psychology, 4*(6), 471–482.

Hicks, J. A., Schlegel, R. J., & King, L. A. (2010). Social threats, happiness, and the dynamics of meaning in life judgments. *Personality and Social Psychology Bulletin, 36*(10), 1305–1317.

Hicks, J. A., Trent, J., Davis, W. E., & King, L. A. (2012). Positive affect, meaning in life, and future time perspective: An application of socioemotional selectivity theory. *Psychology and Aging, 27*(1), 181–189.

Kashdan, T. B., & Steger, M. F. (2007). Curiosity and stable and pathways to well-being and meaning in life: Traits, states, and everyday behaviors. *Motivation and Emotion, 31,* 159–173.

King, L. A., & Hicks, J. A. (2009). Detecting and constructing meaning in life events. *The Journal of Positive Psychology, 4*(5), 317–330.

King, L. A., Hicks, J. A., Krull, J. L., & Del Gaiso, A. K. (2006). Positive affect and the experience of meaning in life. *Journal of Personality and Social Psychology, 90*(1), 179–196.

Krause, N. (2004). Stressors arising in highly valued roles, meaning in life, and the physical health status of older adults. *Journal of Gerontology, 59*(5), 287–297.

Krause, N. (2007). Longitudinal study of social support and meaning in life. *Psychology and Aging, 22*(3), 456–469.

Lambert, N. M., Stillman, T. F., Baumeister, R. F., Fincham, F. D., Hicks, J. A., & Graham, S. M. (2010). Family as a salient source of meaning in young adulthood. *The Journal of Positive Psychology, 5*(5), 367–376.

Lambert, N. M., Stillman, T. F., Hicks, J. A., Kamble, S., Baumeister, R. F., & Fincham, F. D. (2013). To belong is to matter: Sense of belonging enhances meaning in life. *Personality and Social Psychology Bulletin, 39*(11), 1418–1427.

Maniaci, M. R., & Rogge, R. D. (2013). Caring about carelessness: Participant inattention and its effects on research. *Journal of Research in Personality, 48,* 61–83.

Marco, C. A., & Suls, J. (1993). Daily stress and the trajectory of mood: Spillover, response assimilation, contrast, and chronic negative affectivity. *Journal of Personality and Social Psychology, 64*(6), 1053–1063.

Martela, F., & Ryan, R. M. (2016a). Prosocial behavior increases well-being and vitality even without contact with the beneficiary: Causal and behavioral evidence. *Motivation and Emotion, 40*(3), 351–357.

Martela, F., & Ryan, R. M. (2016b). The benefits of benevolence: Basic psychological needs, beneficence, and the enhancement of well-being. *Journal of Personality, 84*(6), 750–764. doi:10.1111/jopy.12215.

Martela, F., & Steger, M. (2016). The three meanings of meaning in life: Distinguishing coherence, purpose and significance. *Journal of Positive Psychology, 11*(5), 531–545.

McGregor, I., & Little, B. R. (1998). Personal projects, happiness, and meaning: On doing well and being yourself. *Journal of Personality and Social Psychology, 74,* 494–512.

Morgan, J., & Farsides, T. (2009). Measuring meaning in life. *Journal of Happiness Studies, 10*(2), 197–214.

Niemiec, C. P., Ryan, R. M., & Deci, E. L. (2009). The path taken: Consequences of attaining intrinsic and extrinsic aspirations in post-college life. *Journal of Research in Personality, 43*(3), 291–306.

Nozick, R. (1981). *Philosophical explanations.* Cambridge, Mass.: Harvard University Press.

Paulhus, D. L. (1991). Measurement and control of response bias. In J. P. Robinson, P. R. Shaver, & L. S. Wrightsman (Eds.), *Measures of personality and social psychological attitudes* (Vol. 1, pp. 17–59). San Diego: Academic Press.

Quené, H., & Van den Bergh, H. (2004). On multi-level modeling of data from repeated measures designs: A tutorial. *Speech Communication, 43*(1), 103–121.

Reis, H. T., Sheldon, K. M., Gable, S. L., Roscoe, J., & Ryan, R. M. (2000). Daily well-being: The role of autonomy, competence, and relatedness. *Personality and Social Psychology Bulletin, 26*(4), 419–435.

Reker, G. T., Peacock, E. J., & Wong, P. T. P. (1987). Meaning and purpose in life and well-being: A life-span perspective. *Journal of Gerontology, 42*(1), 44–49.

Ryan, R. M. (1995). Psychological needs and the facilitation of integrative processes. *Journal of Personality, 63,* 397–427.

Ryan, R. M., Bernstein, J. H., & Brown, K. W. (2010). Weekends, work, and well-being: Psychological need satisfactions and day of the week effects on mood, vitality, and physical symptoms. *Journal of Social and Clinical Psychology, 29*(1), 95–122.

Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual Review of Psychology, 52*(1), 141–166.

Ryan, R. M., & Deci, E. L. (2004). Overview of self-determination theory: An organismic dialectical perspective. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 3–33). Rochester, NY: University of Rochester Press.

Ryan, R. M., & Martela, F. (2016). Eudaimonia as a way of living: Connecting Aristotle with self-determination theory. In J. Vittersø (Ed.), *Handbook of eudaimonic wellbeing* (pp. 109–122). New York: Springer.

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology, 57*(6), 1069–1081.

Sadikaj, G., Moskowitz, D. S., & Zuroff, D. C. (2011). Attachment-related affective dynamics: Differential reactivity to others' interpersonal behavior. *Journal of Personality and Social Psychology, 100*(5), 905–917.

Schlegel, R. J., Hicks, J. A., Arndt, J., & King, L. A. (2009). Thine own self: True self-concept accessibility and meaning in life. *Journal of Personality and Social Psychology, 96*(2), 473–490. doi:10.1037/a0014060.

Schnell, T. (2011). Individual differences in meaning-making: Considering the variety of sources of meaning, their density and diversity. *Personality and Individual Differences, 51*(5), 667–673.

Schwarz, N. (2001). Feelings as information: Implications for affective influences on information processing. In L. L. Martin & G. L. Clore (Eds.), *Theories of mood and cognition: A user's handbook* (pp. 159–176). Mahwah, NJ: Lawrence Erlbaum.

Shek, D. T. L., Ma, H., & Cheung, P. (1994). Meaning in life and adolescent antisocial and prosocial behavior in a Chinese context. *Psychologia, 37*(4), 211–218.

Sheldon, K. M., Elliot, A. J., Kim, Y., & Kasser, T. (2001). What is satisfying about satisfying events? Testing 10 candidate psychological needs. *Journal of Personality and Social Psychology, 80*(2), 325–339.

Sheldon, K. M., & Hilpert, J. C. (2012). The balanced measure of psychological needs (BMPN) scale: An alternative domain general measure of need satisfaction. *Motivation and Emotion, 36,* 439–451.

Shrira, A., Palgi, Y., Ben-Ezra, M., & Shmotkin, D. (2011). How subjective well-being and meaning in life interact in the hostile world? *Journal of Positive Psychology, 6*(4), 273–285.

Steger, M. F. (2012). Experiencing meaning in life—Optimal functioning at the nexus of well-being, psychopathology, and spirituality. In P. T. Wong (Ed.), *The human quest for meaning: Theories, research, and applications* (2nd ed., pp. 165–184). New York: Routledge.

Steger, M. F., Frazier, P., Oishi, S., & Kaler, M. (2006). The Meaning in Life Questionnaire: Assessing the presence of and search for meaning in life. *Journal of Counseling Psychology, 53*(1), 80–93.

Steger, M. F., & Kashdan, T. B. (2013). The unbearable lightness of meaning: Well-being and unstable meaning in life. *The Journal of Positive Psychology, 8*(2), 103–115.

Steger, M. F., Kashdan, T. B., & Oishi, S. (2008a). Being good by doing good: Daily eudaimonic activity and well-being. *Journal of Research in Personality, 42*(1), 22–42.

Steger, M. F., Kashdan, T. B., Sullivan, B. A., & Lorentz, D. (2008b). Understanding the search for meaning in life: Personality, cognitive style, and the dynamic between seeking and experiencing meaning. *Journal of Personality, 76*(2), 199–228.

Steger, M. F., Oishi, S., & Kashdan, T. B. (2009). Meaning in life across the life span: Levels and correlates of meaning in life from emerging adulthood to older adulthood. *The Journal of Positive Psychology, 4*(1), 43–52.

Steger, M. F., Oishi, S., & Kesebir, S. (2011). Is a life without meaning satisfying? The moderating role of the search for meaning in satisfaction with life judgments. *The Journal of Positive Psychology, 6*(3), 173–180.

Steger, M. F., & Samman, E. (2012). Assessing meaning in life on an international scale: Psychometric evidence for the Meaning in Life Questionnaire-Short Form among Chilean households. *International Journal of Wellbeing, 2,* 182–195.

Stillman, T. F., Baumeister, R. F., Lambert, N. M., Crescioni, A. W., DeWall, C. N., & Fincham, F. D. (2009). Alone and without purpose: Life loses meaning following social exclusion. *Journal of Experimental Social Psychology, 45*(4), 686–694.

Trent, J., & King, L. A. (2010). Predictors of rapid versus thoughtful judgments of meaning in life. *Journal of Positive Psychology, 5*(6), 439–451. doi:10.1080/17439760.2010.534106.

Twenge, J. M., & Kasser, T. (2013). Generational changes in materialism and work centrality, 1976–2007 associations with temporal changes in societal insecurity and materialistic role modeling. *Personality and Social Psychology Bulletin, 39*(7), 883–897. doi:10.1177/0146167213484586.

Van Tongeren, D. R., Green, J. D., Davis, D. E., Hook, J. N., & Hulsey, T. L. (2016). Prosociality enhances meaning in life. *The Journal of Positive Psychology, 11*(3), 225–236.

Vess, M., Routledge, C., Landau, M., & Arndt, J. (2009). The dynamics of death and meaning: The effects of death-relevant cognitions and personal need for structure on perceptions of meaning in life. *Journal of Personality and Social Psychology, 97*(4), 728–744.

Waterman, A. S. (1993). Two conceptions of happiness: Contrasts of personal expressiveness (eudaimonia) and hedonic enjoyment. *Journal of Personality and Social Psychology, 64*(4), 678–691.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063–1070.

Weinstein, N., Ryan, R. M., & Deci, E. L. (2012). Motivation, meaning, and wellness: A self-determination perspective on the creation and internalization of personal meanings and life goals. In P. T. Wong (Ed.), *The human quest for meaning: Theories, research, and applications* (2nd ed., pp. 81–106). New York: Routledge.

Wong, P. T. P. (1989). Successful aging and personal meaning. *Canadian Psychology, 30,* 516–525.