

General Need for Autonomy and Subjective Well-Being: A Meta-Analysis of Studies in the US and East Asia

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Abstract Self-determination theory proposes that human beings have universal basic psychological needs for autonomy, competence, and relatedness, which when satisfied lead to well-being. The current meta-analysis synthesized the correlations between the need for autonomy and subjective well-being. More specifically, because some researchers have questioned the role of autonomy in well-being in non-Western cultures, our meta-analysis focused on the results reported from studies conducted in the United States (US, a typical individualist culture) and East Asian countries (typical collectivist cultures). Random-effects analyses using 36 independent samples (22 from the US and 14 from East Asian samples including China and Japan) totaling 12,906 participants showed a moderate correlation ($r = .46, p < .001$) between autonomy and subjective well-being. The difference between correlations for studies conducted in the East and West was not significant ($\Delta r = .05, p > .05$). Overall, this study lends support to self-determination theory's proposition that autonomy is a universal psychological need and provides suggestions for cultural practices and policies.

Keywords Autonomy · Self-determination theory · Subjective well-being · Basic psychological needs · Culture · Happiness

Happiness is the universal goal of humanity (Aristotle 2001), and with the rise of the positive psychology movement (Seligman and Csikszentmihalyi 2000), psychologists have invested considerable effort into empirically measuring happiness and investigating its influencing factors. The current study aims to summarize the extant evidence on the effect of one specific factor—need for autonomy—on happiness.

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1 Happiness Defined

This investigation focuses on happiness operationalized as subjective well-being (SWB), which is the most popular and recognized conceptualization of happiness in modern psychology (Diener 2000). SWB considers happiness to be reflected by people's evaluations of their lives—evaluations that are both affective and cognitive. People experience high SWB when they feel many pleasant and few unpleasant emotions and when they are satisfied with their lives (Diener 2000). The most commonly used measurements of SWB in previous research include the *Positive and Negative Affect Schedule* (Watson et al. 1988) to assess the affective component and the *Satisfaction with Life Scale* (Diener et al. 1985) to assess the cognitive component. These components are then combined to generate a composite SWB score that reflects overall happiness.

To obtain a more accurate conceptualization of happiness, we also want to differentiate it from what we think it is not. Specifically, some researchers have conceptualized happiness as a good way of living one's life, or *eudaimonia* (Waterman 2013). For example, Ryff (1989) conceptualized happiness as composed of six factors including self-acceptance, meaning and purpose in life, and personal growth. According to this conceptualization, a happy person should have an open and positive attitude toward the self, feel that his or her life is directed by some higher order meaning or goal, and have a sense of self development and expansion, among others. We agree that these are important facets of a thriving life but contend that they are better conceptualized as predictors of happiness rather than happiness itself. As Sheldon (2013, 2016) argued, these eudaimonic factors are somewhat value-laden, and people may or may not agree that they are desirable ways of living. In contrast, by combining a diverse range of affective and cognitive indicators, SWB is more value-free and will better serve as an indicator of happiness that can be applied in all populations.

2 Basic Psychological Needs as a Predictor of SWB

Of the various factors influencing SWB, one of the most researched is basic psychological needs (BPN), which were proposed in self-determination theory (SDT, Deci and Ryan 2000; Vansteenkiste et al. 2010). More specifically, SDT assumes an active, growth-oriented human nature, which leads to happiness when appropriately functioning. SDT also proposes that people need to feel autonomous, related, and competent in order to function optimally and behave in congruence with their innate growth tendency. The importance of these three needs for human thriving has been compared with the importance of physical nutrients for the growth of plants. Hence, Deci and Ryan (2000) theorized that the satisfaction of these needs is essential for well-being. Autonomy is defined as self-governance, or the need to organize one's experiences in a self-congruent manner and to feel volitional in regulating one's behavior; relatedness is defined as the need to form meaningful and intimate social relationships, to care for and be cared for; and competence is the ability to have an effect on the environment as well as to attain valued outcomes within it (Deci and Ryan 2000).

A considerable body of literature has focused on examining these SDT propositions, and specifically, how to accurately measure the satisfaction of these three basic needs. To date, four major scales have been developed to measure BPN in a general context, and they are summarized in Table 1. The first scale was described in a seminal study by Ilardi et al.

Table 1 Details of seminal autonomy measurements

Authors	Year	Subscales	No. of items	Reliability		Citing articles Titles reviewed ^a	Text reviewed ^b	Sample items
				Original report	Current review			
Ilardi et al.	1993	Satisfaction	7	NA ^c	.47–.89	476 + 328	43 (6)	I feel like I am free to decide for myself how to live my life.
Gagné ^d	2003					441 + 393	19 (1)	
Sheldon and Hilpert et al.	2001	Satisfaction ^e	3	NA	.52–.76	186 + 395	42 (4)	My choices are based on my true interests and values.
Sheldon and Hilpert	2012	Satisfaction and Dissatisfaction	3 for each subscale, 6 in total	.72(S) .46(D)	.84	45 + 46	2	Satisfaction: I was free to do things my own way. Dissatisfaction: I had a lot of pressures I could do without.
Chen et al.	2015b	Satisfaction and Frustration	4 for each subscale, 8 in total	.69–.85	.77–.82	29 + 28	1	Satisfaction: I feel a sense of choice and freedom in the things I undertake. Frustration: I feel pressured to do many things.

^a for “Titles Reviewed”, the first number is the titles reviewed during the first round, and the second number represents the number reviewed in the second round. As can be expected, there was much overlap between the items reviewed

^b for “Text Reviewed”, the number in parentheses denotes the number of theses/dissertations among the texts reviewed

^c Alpha coefficient not reported in the original publications

^d This is a different citation frequently used for the scale proposed in the study by Ilardi et al. (1993). The scales are the same, and thus the subscale information, no. of items, reliability and sample items are the same as in the first row

^e Sheldon and Gunz (2009) added 3 negative items to this scale, and it thus consists of both satisfaction and frustration of the need for autonomy

(1993, or also frequently cited as Gagné 2003) and consists of 21 items that measure the three BPN using both positively worded and negatively worded items. This scale has been the most popular way of operationalizing BPN to date. Sheldon et al. (2001) used a different approach to measuring psychological needs. Unlike Iardi et al., they aimed to measure BPN by focusing on people's experiences during real events, rather than their overall impression on life. In their instrument, they asked participants to identify some of their most satisfying and most dissatisfying events and to rate the extent to which they had certain psychological experiences during these specified events. Three items were used to measure the three BPN for these experiences. These authors found that the three BPN were consistently the most predictive factors of whether an event was satisfying or dissatisfying. Their measurement of BPN has subsequently been applied to studies that examine general satisfaction in life, rather than using the initial event-based procedures (e.g., Sheldon and Niemiec 2006). The third measurement was developed by Sheldon and Hilpert (2012). These authors argued, based on Johnston and Finney's (2010) analyses, that negative items do not represent only wording variation but actually measure dissatisfaction¹ of BPN, which is a different psychological process from the satisfaction measured by positively worded items. Hence, they developed a measure in which the items were balanced between satisfaction and dissatisfaction and between the three needs. However, Sheldon and Hilpert's (2012) scale showed low internal consistency for some subscales (e.g., their autonomy frustration subscale had an alpha of .46 only; see Table 1). Subsequently, Chen et al. (2015b) developed the most recent measurement of BPN, a 24-item scale also featuring a balanced number of satisfaction and frustration items, to assess the three needs. More importantly, the scale proposed by Chen et al. (2015b) had satisfactory levels of internal consistency for all subscales and was shown to be consistent across four diverse cultures.

Most studies examining the relationship between needs and well-being in life have generally used one of these scales² and have supported the relationship between autonomy need satisfaction and SWB in diverse settings and populations, including in clinical samples (Breitborde et al. 2012), family relationships (Costa et al. 2015b), work environments (Vansteenkiste et al. 2007), and educational settings (Niemiec and Ryan 2009). However, occasional non-supportive results do exist (e.g., see Church et al. 2013).

In addition, recent research has begun to differentiate between the effects of need satisfaction, need dissatisfaction (i.e., lack of satisfaction), and frustration (i.e., active undermining of needs) on well-being. SDT researchers argue that while satisfaction of needs facilitates and dissatisfaction hampers psychological growth and well-being, frustration can be actively destructive and pathogenic (Vansteenkiste and Ryan 2013; Deci and Ryan 2000). For example, individuals may experience low satisfaction with autonomy when they do not identify with their job, resulting in less vitality and enthusiasm for work; however, individuals can also experience active control, surveillance and hierarchy in the workplace, and these factors can lead to stress and depression. Therefore, satisfaction would have a stronger predictive effect for positive well-being indicators (e.g., positive

¹ From the perspective of more recent conceptualizations (Costa et al. 2015a), what Sheldon and Hilpert measured as the opposite to need satisfaction can be argued to be a mixture of need dissatisfaction and need frustration.

² It should be noted that many studies measured BPN in a specific domain (e.g., in relationships: La Guardia et al. 2000; education: Jang et al. 2009; physical exercise: Sylvester et al. 2012; work: Baard et al. 2004; and role-related domain: Talley et al. 2012). These studies are not included in the current meta-analysis because we focused on the effect of autonomy on well-being in the general life context. However, these studies also provide valuable support for the conceptualization and importance of autonomy.

affect, vitality), and frustration would be more related to ill-being indicators (e.g., negative affect). Recently, Costa et al. (2015a) empirically showed that these aspects of basic needs experiences are qualitatively different in terms of measurement and predictive validity; the differences cannot be simply attributed to wording valence. Gunnell et al. (2013) found that while changes in need satisfaction predicted positive and negative well-being indicators, changes in need frustration predicted only negative, not positive outcomes. Similarly, Adie et al. (2012) found that a lack of need satisfaction did not predict ill-being.

3 Autonomy and Well-Being

We decided to focus on the relationship between well-being and one of the three needs—autonomy—in our study. SDT proposes that when people’s need for autonomy is satisfied, they perceive that their actions are self-congruent and volitional, and this will lead to benefits in well-being (Deci and Ryan 2000). We focused on autonomy for two reasons. First, autonomy is central to SDT because it is directly relevant to individuals’ innate integrative tendency (Deci and Ryan 2000). Indeed, because autonomy is essential to the initiation and regulation of behavior, through which other needs are better realized (Ryan and Deci 2017, p. 250), some have even argued that autonomy is a “meta-need” (Assor 2017). Second, relatedness and competence have been widely researched and are recognized as important aspects of human functioning (e.g., Bandura 1977; Baumeister and Leary 1995), whereas autonomy is a unique contribution of SDT and has faced the greatest controversy concerning its status as a true need (e.g., Iyengar and DeVoe 2003). Therefore, reviewing the current literature, providing a general understanding of the relationship between well-being outcomes and the satisfaction and frustration of the need for autonomy, and identifying any inconsistencies in the literature (if they exist) are of particular theoretical value and may advance the field.

4 Cultural Differences in the Relationship Between Autonomy and Well-Being

The field of well-being has long disagreed over whether human happiness is determined by innate needs, which are universal to human nature and formed in evolution, or by socialization processes that are specific to cultures (Tay and Diener 2011). For example, among the advocates of the latter perspective, some researchers assume a “cultural relativist” position on autonomy (e.g., Iyengar and Lepper 1999; Oishi 2000) and argue that autonomy is a value endorsed by Western, individualistic, liberal societies and would thus be less beneficial for people in Eastern, collectivistic societies. By contrast, SDT researchers have argued that the term autonomy has suffered from jingle–jangle fallacies because researchers often define it as independence, or as one’s actions not relying on others (e.g., Smetana et al. 2004), whereas the SDT definition focuses on volitional experience. Although the effects of autonomy may vary by culture when conceptualized as independence, separation and individualism, as critics have done, when defined as the need to volitionally self-regulate and self-organize, SDT argues that autonomy is a universal human need and would predict well-being regardless of culture (Ryan and Deci 2017).

A recent study by Van Petegem et al. (2013) empirically differentiated between autonomy as defined in SDT and the autonomy construct defined as “individualism,

independence, and separateness”, thereby supporting the difference in the conceptualization of autonomy. They also found that the SDT definition of autonomy was the only one to predict well-being. Many other studies have provided support for the relationship between autonomy (as defined in SDT) and well-being. For example, Chirkov et al. (2003) found that the results from four cultures (the US, Korea, Russia, and Turkey) supported the claim that autonomy positively predicts well-being. Specifically, they found that autonomy in cultural internalization, or identifying with one’s culture out of personal choice or because it is of personal value rather than as a result of social pressure, predicted higher SWB. Furthermore, Sheldon et al. (2001) employed an event-based methodology and showed that autonomy, in addition to competence and relatedness, predicted university students’ well-being in response to a certain event in both the US and South Korea.

More recently, Chen et al. (2015b) found that the need for autonomy (along with the other two needs) had a unique positive association with well-being and that this association did not vary across the four cultures sampled (the US, China, Peru, and Belgium). Similar results have been obtained in other multi-country studies, including nations as diverse as Brazil (Chirkov et al. 2005), Bulgaria (Deci et al. 2001) and Japan (Church et al. 2013).

In sum, the research examining the relationship between autonomy need satisfaction and SWB has burgeoned since 2000, but a broader picture of these relationships is still lacking; large-scale tests comparing this relationship between cultures are also not available. Therefore, a meta-analytical method was considered most relevant to providing new knowledge on these issues. Accordingly, we used a meta-analysis approach to synthesize and quantify the association between autonomy need and well-being and to examine whether the association remained true in both Western individualistic society (represented by the US) and in East Asian collectivist societies.

5 Research Questions

Our two research questions were as follows:

- (1) Is there a significant relationship between well-being and satisfaction of the need for autonomy as defined by SDT? How consistent is this relationship between studies?

In the event of significant heterogeneity of relationships between studies, our second goal was to examine the moderation by culture, and the corresponding research question is:

- (2) Do differences between Eastern and Western populations explain the difference in the relationship between autonomy and SWB?

6 Method

6.1 Data Sources

We aimed to acquire all studies that reported the relationship between autonomy defined by SDT and well-being. More specifically, we first attempted to obtain all relevant studies using *Google Scholar* by searching within the literature that cited any one of the five SDT articles describing the development of one of the four main BPN measurement scales (reported in Table 1). It is reasonable to assume that most studies measuring autonomy as

defined in SDT would reference at least one of these five studies. We selected this strategy because the term autonomy has been subject to jingle-jangle fallacies (Van Petegem et al. 2013), as mentioned above, and we wanted to ensure that the autonomy measure used in the study would be consistent with the definition of autonomy according to SDT. With this method, we were able to include studies that used only one of these scales or minor revisions of them.

We searched the literature citing the aforementioned scales using combinations of relevant terms, including “self-determination theory”, “well-being”, “affect”, “basic psychological need”, and location terms including the US and all East Asian countries or regions.³ Two rounds of electronic searches were conducted, with the second round using broader search terms to double check our findings and include more potential articles. Relevant studies were selected for full-text review based on a review of the titles and our understanding of the content after reading the abstracts. The number of hits in *Google Scholar* and the reviewed papers, as well as the number of theses/dissertations included therein, are listed in Table 1.

After the *Google Scholar* search was completed, we complemented the findings with a search of *PsycInfo*. The search terms included combinations of “self-determination theory”, “basic psychological need”, and “well-being” and resulted in 77 hits, nine of which were reviewed in full. To obtain better coverage of the research conducted in East Asia, we also searched the literature written in Chinese, Korean and Japanese. Three researchers fluent in Chinese, Korean and Japanese, who were all familiar with SDT, were given standardized search instructions consistent with the English literature search. The search for East Asian literature followed a similar process as the search for English literature, except that to identify studies in China, we also searched *xueshu.baidu.com*, which is the Chinese equivalent of *Google Scholar*. Four studies written in Chinese were included, whereas no studies written in Korean or Japanese were found to qualify. Finally, we also checked certain review papers on SDT (e.g., Deci and Ryan 2000; Vansteenkiste et al. 2010; Liu et al. 2013) to identify additional relevant studies.

6.2 Inclusion/Exclusion Criteria

6.2.1 Generality of Focus

We considered studies that focused on the association between “domain-general autonomy” and “domain-general subjective well-being”. We included studies with all time frames of measurement, and thus participants could be asked about their general BPN and SWB “generally in life”, in the “last month”, “now”, etc. However, the measurements of autonomy and SWB had to assess the same time frames. For example, we excluded studies in which participants were asked about the satisfaction of their need for autonomy in life in general but their well-being in terms of a certain event.

6.2.2 Measurement of SWB

The inclusion of SWB measurements followed the conceptualization of Kahneman et al. (1999) and incorporated three components: cognitive appraisal (i.e., satisfaction with life,

³ According to the United Nations Statistics Division (n.d.), countries or regions in East Asia include China, Taiwan, Hong Kong, Macau, Japan, South Korea, North Korea, and Mongolia. In our review, we found relevant studies in Mainland China, Taiwan, Hong Kong and Japan only.

SWL), positive affect (PA) and negative affect (NA). We excluded research that measured eudaimonia, such as the concept of psychological well-being proposed by Ryff (1989), in accordance with the distinction described previously in the introduction. We also excluded pathological syndromes because they conflicted with our goal of evaluating “general well-being”. We excluded studies that assessed only intrinsic motivation for an activity for the same reason. Some studies did not explicitly mention well-being but were nonetheless included because they measured constructs that could be considered a component of well-being. In the current collection of studies, depression, anxiety and stress were included as NAs, and vitality was included as a PA.

6.2.3 Countries, Research Methodology and Publication Format

We included studies that were conducted in the US and all East Asian countries. Studies from each of the East Asian countries were relatively few in number, and they were thus combined to generate a number of studies ($k = 14$) more comparable to that of the US ($k = 22$). Of the 14 East Asian samples, eight were from Mainland China, two were from Japan and Hong Kong each, and one was from Taiwan. One sample of Chinese sojourners in Belgium (Vansteenkiste et al. 2006) was counted as an Eastern sample, as the participants had lived in Belgium for an average of only eight months.⁴ One study was conducted using the Amazon MTurk online survey tool (Martela and Ryan 2015), and these respondents were counted as a US sample considering their ethnic composition and MTurk user statistics (Ipeirotis 2015). We considered studies with any method or source of data collection, but all studies collected used self-report. We considered all forms of publication, yet most of them were English journal articles, with the exception of one English dissertation, two Chinese journal articles and two Chinese dissertations/theses.

6.2.4 Examples of Excluded Studies

Some studies that were conceptually highly relevant to the current investigation were not included in the meta-analysis for the following reasons: not reporting r values for each of the three needs separately (e.g., Chen et al. 2014), having an undetermined location of data collection (e.g., Schüler et al. 2013), focusing on domain-specific variables (e.g., Longo et al. 2014), not using the SDT measurement of autonomy (e.g., Hollifield and Conger 2015), reporting partial regression weights (b) rather than r values (e.g., Hahn, and Oishi 2006), using different time frames to measure autonomy and SWB (e.g., asking about autonomy in a specific event but satisfaction with life in general, as in Robak and Nagda 2011), and using a pathological measurement of well-being (Breitborde et al. 2012).

6.2.5 Number of Studies and Effect Sizes

These inclusion and exclusion criteria resulted in a relatively stringent sample: a total of 27 studies with 36 independent samples comprising a total of 12,906 participants were included in the meta-analysis and are summarized in Table 2. Because 16 of the 36

⁴ Although this study did not strictly meet the location requirement, the inclusion of this study was believed to contribute to more than detract from a precise estimation, considering the relative few number of Eastern samples and the relatively short time the Chinese sample had lived in Belgium. Indeed, this sample was treated as culturally Chinese in the original study. We also conducted the analyses without this study, and the results were essentially the same: the differences in correlations were less than .01, both for the Eastern population and on the whole; the cultural moderation test results were still non-significant.

Table 2 Coding of independent samples

Study	Age group	N for the ES	Positive SWB	Location	Autonomy need scale	SWB used for the "All SWB" analysis	SWB reported in the primary study
Anthony (2011)	C	505	0.56	W	Ilardi et al. (1993)	SWL	SWL
Breitborde et al. (2012)	YCA	47	0.27	W	Ilardi et al. (1993)	Other NA	Other NA
Breitborde et al. (2015)	-	43	0.48	W	Ilardi et al. (1993)	Other	Other
Chang et al. (2015a)	C	342	0.47	W	Ilardi et al. (1993)	Depression	Depression
Chang et al. (2015b)	C	194	0.49	E	Ilardi et al. (1993)	Overall SWB	PA, NA, SWL
Chen et al. (2015a)	A	357	0.45	E	Chen et al. (2015b) S	Other	Other
Chen et al. (2013)	Y	583	0.42	E	Sheldon et al. (2001) S	Other	Other
Church et al. (2013)	C	153	0.1	W	Other	Aggregate relative PA	Other PA, other NA
Church et al. (2013)	C	223	0.26	E	Other	Aggregate relative PA	Other PA, other NA
Church et al. (2013)	C	191	0.14	E	Other	Aggregate relative PA	PA, other NA
Dupuis and Newby-Clark (2016)	CAS	312	0.54	W	Ilardi et al. (1993)	Aggregate relative PA	Other PA, other NA, vitality
Johnston and Finney (2010)	C	492	0.16	W	Ilardi et al. (1993)	Anxiety	Anxiety
Kashdan et al. (2009)	C	190	0.42	W	Ilardi et al. (1993)	Aggregate relative PA	PA, NA
Li (2010a) C	Y	748	0.46	E	Ilardi et al. (1993)	Aggregate overall SWB	Other PA, other NA, other satisfaction
Martela and Ryan (2015)	CAS	332	0.71	W	Chen et al. (2015b) S	Overall SWB	Overall SWB
Martela and Ryan (2015)	CAS	180	0.38	W	Sheldon et al. (2001) S	Overall SWB	Overall SWB
Martela and Ryan (2015)	C	89	0.71	W	Sheldon and Hilpert (2012) S	Aggregate PA	Other PA, vitality
Molix and Nichols (2013)	CAS	156	0.52	W	Ilardi et al. (1993)	Overall SWB	Overall SWB
Nishimura and Suzuki (2016)	C	564	0.37	E	Chen et al. (2015b) SF	Aggregate overall SWB	Vitality, depression, SWL

Table 2 continued

Study	Age group	N for the ES	Positive SWB	Location	Autonomy need scale	SWB used for the "All SWB" analysis	SWB reported in the primary study
Qiu et al. (2012)	C	270	0.4	E	Other	Overall SWB	Overall SWB
Sheldon and Niemiec (2006)	C	315	0.48	W	Sheldon et al. (2001)	Aggregate overall SWB	Overall SWB, other
Sheldon and Niemiec (2006)	C	145	0.58	W	Other	Aggregate overall SWB	Overall SWB, other
Sheldon and Niemiec (2006)	CA	91	0.49	W	Other	Other	Other
Sheldon and Schüller (2011)	C	939	0.31	W	Sheldon et al. (2001)	Other PA	Other PA
Sheldon and Schüller (2011)	C	155	0.46	W	Sheldon et al. (2001)	Overall SWB	Overall SWB
Sheldon and Schüller (2011)	C	592	0.51	W	Sheldon et al. (2001)	Overall SWB	Overall SWB
Sheldon and Schüller (2011)	C	132	0.49	W	Ilardi et al. (1993)	Overall SWB	Overall SWB
Şimşek and Demir (2013)	C	290	0.62	W	Ilardi et al. (1993)	Relative PA	Relative PA
Siu et al. (2016)	KYCAS	367	0.55	E	Ilardi et al. (1993)	Other	Other
Uysal et al. (2010)	CAS	180	0.54	W	Ilardi et al. (1993)	Aggregate overall SWB	Vitality, stress, anxiety, SWL
Vansteenkiste et al. (2006)	CA	117	0.56	E	Ilardi et al. (1993)	Overall SWB	Overall SWB
Wang (2008)	C	209	0.31	E	Ilardi et al. (1993)	Aggregate overall SWB	SWL, other PA, other NA
Wang et al. (2015)	YC	1727	0.42	E	Ilardi et al. (1993)	Other	Other
Wei et al. (2005)	CA	299	0.51	W	Ilardi et al. (1993)	Aggregate NA	Depression, other NA
Wong et al. (2014)	C	229	0.45	E	Ilardi et al. (1993)	Aggregate NA	Depression, anxiety, stress
Yang et al. (2013)	KY	1148	0.61	E	Ilardi et al. (1993)	Other satisfaction	Other satisfaction

Study "C" means that the paper was written in Chinese. Age group: K = children under 13, Y = adolescents aged 13–17, C = college-aged (18–22), A = adults aged 23–60, S = Seniors aged 60 years and above. The Siu et al. (2016) study only reported including participants aged 55 years and above, and we decided to count this sample as including seniors. Location: E = Eastern, W = Western. Autonomy Need Scale: "S" means that only satisfaction (positively worded) items were used in this study, although the negative components were available for this scale; "SF" means that both satisfaction and frustration subscales were used; the others without S or SF were cases in which the scale used did not differentiate between satisfaction and frustration components. The Ilardi et al. (1993) reference also covered articles that cited Gagné (2003). "Other" means that the study used a slight revision of one of the four SDT autonomy scales

independent samples provided multiple effect sizes for different SWB measures, the total number of effect sizes (including those dependent on each other) was 69: 20 independent effect sizes and 49 effect sizes that were dependent on at least one other effect size.

6.3 Coding of Studies

The first author extracted the following variables from the primary studies: author, year, journal/book title, sampling method, source of participants, participant age range,⁵ age mean and SD, gender composition, study location, number of participants, racial and ethnic composition of the US sample, type of study design, type of autonomy scale used, Cronbach's alpha of autonomy scales, level of Likert scale for autonomy, type of SWB scale used, level of Likert scale for SWB, Cronbach's alpha of SWB, N for effect size, and type and value of effect size. Ten studies were randomly selected from the total 27 and were double-coded by a second coder who had experience in meta-analyses and was bilingual in English and Chinese. The coders had moderate agreement (>70% of the values were the same) on most variables, including the most important ones for calculation, i.e., effect size and sample size. The coders discussed the differences and collectively determined the final codes, and thus 100% agreement was reached on these double-coded articles. The first author applied the discussion results to the remaining codings.

6.4 Characteristics of Included Studies

Seven of the 36 samples failed to provide age statistics; among the studies that did, the average reported mean age was 23.2, and the mean of the sample size-weighted age was 21.1; the median of mean ages was 20.8. The publication years ranged from 2006 to 2016. Most studies (20 out of 36) used the scale proposed by Ilardi et al. (1993) to measure autonomy. Of the 69 effect sizes, 27 measured NA, 16 measured PA, 12 reported composite SWB, seven measured cognitive satisfaction, and seven used other measurements of SWB.

6.5 Meta-Analytic Procedures

We used Hedges and Olkin's meta-analytic method (Hedges and Olkin 1985). A random-effects model was used as the theoretical framework for synthesizing the effect sizes because we assumed that each primary study represented its own population effect size, due to the inherent differences in the nature of the studies. Hence, in the random-effects model, we assumed that the effect sizes represented a random sample distributed about the mean of these effect sizes.

All effect sizes that were retrieved from the studies and included in this meta-analysis were presented as Pearson's correlation r . For the analyses, Pearson's r values were converted to z -scores with Fishers' r -to- z transformation to normalize the sampling distribution. The results were then transformed back to the original r metric for reporting.

⁵ Participants were categorized into five age groups: children under 13 years, adolescents aged 13–17, college-aged (18–22), young and middle-aged adults (23–60), and seniors (over 60). The college-aged group represented a separate group because it was the most sampled age range in our review; the other age groups were divided according to developmental stages (Erikson and Erikson 1998; "Proposed working definition...", n.d.).

Regarding the extraction of r values, we first selected one effect size that best reflected the most recognized definition of SWB (Diener 2000) from each independent sample. More specifically, when the study reported an association between autonomy and SWB in a specific sample, we used “overall SWB” as a representative effect size for that sample (e.g., Study 2 by Martela and Ryan 2015, in Table 2). When the study reported correlations between autonomy and different affective components of SWB, we averaged those r values to produce one “aggregate relative PA” effect size (e.g., the Dupuis and Newby-Clark 2016, study in Table 2). In these cases, correlations with NA were reversed before averaging. When the study reported only one affective or cognitive measure, that effect size was used (e.g., Johnston and Finney 2010, study in Table 2). When the study included a mixture of alternative affect and satisfaction scales, the results were integrated to create an “aggregate overall SWB”, as was the case for the Uysal et al. (2010) study in Table 2. With one effect size from each independent sample, we had 36 independent effect sizes, representing a total sample size of 12,906 for synthesis. The mean sample size of the 36 independent samples was 359, and the median sample size was 250. This collection of effect sizes was referred to as “All SWB” (as seen in Tables 2, 3) in the current analyses. In a subsequent analysis, we synthesized the effect sizes separately for PA, NA, and SWL. We extracted 13 PA, 16 NA, and seven SWL effect sizes.

Sample heterogeneity was estimated with the Q statistic (Borenstein et al. 2009) and I^2 statistic (Higgins et al. 2003). The I^2 statistic was used because the significance test for Q cannot quantify the heterogeneity between studies and is affected by the sample size k (Higgins et al. 2003). I^2 is a statistic that describes the percentage of total variation across studies that is due to heterogeneity rather than chance. According to Higgins and Thompson (2002), I^2 values of approximately 25, 50, and 75 indicate low, medium, and high heterogeneity, respectively. Comprehensive Meta-Analysis 2.0 software and Microsoft Excel were used to conduct all analyses.

7 Results

7.1 The Average Correlation of All SWB

The main results are presented in Table 3. Autonomy was significantly correlated with SWB when all measures of SWB were considered together ($r = .460$, $k = 36$, $p < .001$). A forest plot was used to examine the distribution of effect sizes (Fig. 1). In a forest plot, the squares represent the effect sizes obtained from the studies; the closer the square is to zero, the weaker the effect (i.e., the relationship between autonomy and SWB) is in that study. The diamond at the bottom indicates the effect size synthesized from all studies, and its width represents the variance (or inverse of precision) in the estimation of the average effect. Figure 1 shows that most effect sizes were gathered around the .50 line, except for a few deviations (e.g., the results obtained from Church et al. 2013).

7.2 Average Correlation for Affects and SWL

The strengths of the associations of PA, NA, and all affects⁶ with autonomy were also moderate ($r = .386$, $-.376$, and $.403$, respectively) but weaker than those of All SWB, as

⁶ Some studies (e.g., Simsek and Demir 2013) reported only relative PA, which explains why the effect size for all affect was higher than that of PA and NA.

Table 3 Average effect sizes with 95% confidence intervals and results of heterogeneity tests by SWB and location

Variables	Sample		Effect size and 95% CI			Heterogeneity tests			
	<i>k</i>	<i>N</i>	<i>r</i>	Lower limit	upper limit	<i>Q</i> _{between}	<i>df</i>	<i>p</i>	<i>I</i> ²
All SWB	36	12,906	.460	.415	.502	325.68	35	<.001	89.25
Components of SWB									
PA	13	4109	.386	.315	.453	73.95	12	<.001	83.77
NA	16	4490	-.376	-.448	-.300	121.04	15	<.001	87.61
SWL	7	3548	.487	.393	.570	66.79	6	<.001	91.02
Location									
West	22	5979	.481	.413	.543	1.29	1	.256	
East	14	6927	.429	.367	.487				

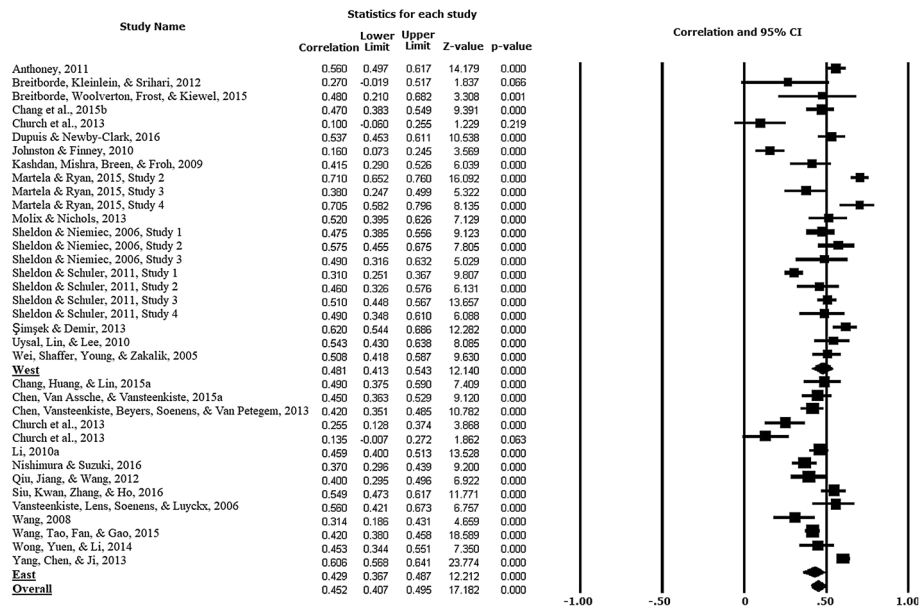


Fig. 1 Forest plot for all SWB results

reported in Table 3. The average correlation between SWL and autonomy was stronger ($r = .487$).

7.3 Heterogeneity and Moderator Analyses

Heterogeneity tests showed that the Q statistic was substantially higher than the degree of freedom, and the significance test of $Q(35) = 325.68$ had a p value $< .001$, which suggests a significant amount of variation between the effect sizes reported by the primary studies. The I^2 statistic indicated that a large proportion (89.25%) of the observed variance reflected

real differences in effect sizes. This result warranted further investigation in the moderator analysis to test for possible cultural effects.

The results of the moderation test by location are shown in Table 3. The effect size in Eastern studies was .429, which was somewhat lower than that of Western studies ($r = .481$, the difference in average $\Delta r = .052$). Because the Q test between subgroups was non-significant ($p = .256$), the observed difference in the average correlation was considered within the margin of error. Therefore, we did not find support for the claim that the satisfaction of the need for autonomy is less important for well-being in Eastern populations.

7.4 Posteriori Power Analyses

Given the non-significant results, we performed a posteriori power analysis of the moderation effect. We identified the distances between the two cultural groups in r values, which were considered small, medium and large, following the conventions proposed by Cohen (1988). In the current sample, if we assumed that the true correlation of the Western group was equal to the sample value of $r = .48$ and that the true correlation for the Eastern group was lower than that for the Western group, then the between-group differences in r that would be considered small, medium and large would be .08, .26, and .46, respectively; the corresponding r s for the Eastern population were .40, .22, and .02. Our power analyses of the differences in correlation coefficients, following the procedures described by Hedges and Pigott (2004), showed that our moderator tests have sufficient power to detect meaningful differences in correlations (i.e., medium or large effect) with a power of over .99, while these tests have a power of .41 for detecting a small moderation effect.

7.5 Publication Bias

We also examined whether our analysis was subject to publication bias. Publication bias refers to the tendency for smaller studies to be published only if they report high effect sizes. An inspection of the funnel plot (Fig. 2) revealed that the distribution of effect sizes

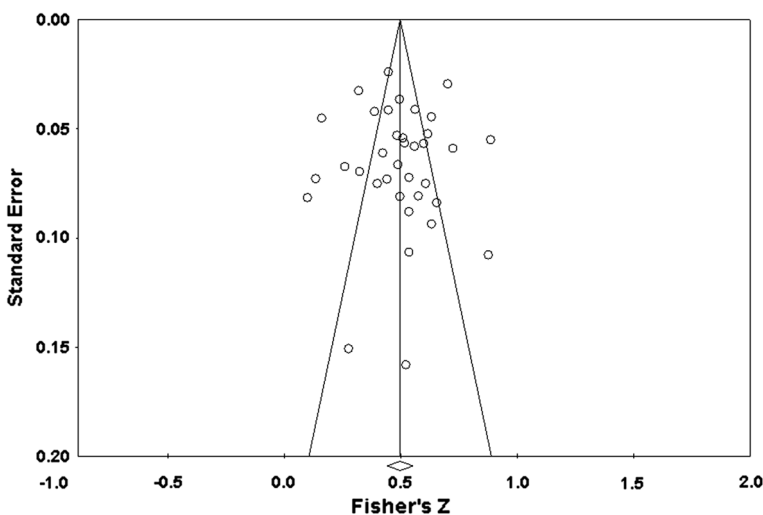


Fig. 2 Funnel plot of standard error by Fisher's Z

by weight was fairly symmetrical; hence, we did not find evidence of publication bias. We also calculated the fail-safe N using Orwin's (1983) formulae, and the results showed that more than 338 studies with a zero effect size would be needed to make the overall association between autonomy need satisfaction and well-being practically insignificant ($r < .10$). This was fairly improbable, considering the small number of studies we identified through our thorough search.

8 Conclusion and Discussion

The current study showed that autonomy need satisfaction had a moderate correlation with SWB and that this relationship did not differ between the US and East Asian population. The results were also unlikely to be subject to data censoring biases.

These results are consistent with previous findings relevant to our topic. Although not included in our meta-analysis because the autonomy measurement did not closely adhere to the SDT paradigm, a study by Tay and Diener (2011) found that feeling autonomous was associated with all three aspects of well-being and that this relationship applied to all cultures. Similarly, our results are largely consistent with those of a recent meta-analysis on BPN conducted in the work domain (Van den Broeck et al. 2016). The current findings lend further support to the claim in SDT that autonomy is a universal human need, as it consistently plays a role in determining the optimal functioning of human beings.

The current study did identify a significant amount of variation between effect sizes, as shown by the Q and I^2 statistics in Table 3. Given the non-significant moderation effect of culture, this variation may be explained by other characteristics of the primary studies. For example, different research designs may have contributed to this variance. Whether the study involves manipulation or intervention, the time span considered when assessing autonomy and well-being experiences (e.g., in general, in the last week, or right now) and the specific measurement instrument used can all affect the effect sizes derived from the primary studies. One specific unforeseen phenomenon in the current study was that the association between autonomy and satisfaction outcomes appeared to be somewhat greater than the association between autonomy and affective measures. This finding might be explained by the fact that compared to affect, satisfaction is a more "eudaimonic" component of SWB (Sheldon 2013). This differential association may have also contributed to the variation in effect sizes.

Relatedly, one limitation of the current study is that we were not able to differentiate between the effects of satisfaction, dissatisfaction, and frustration with the need for autonomy. As previously mentioned (e.g., Gunnell et al. 2013), these aspects of autonomy have distinct predictive effects on components of SWB. Most likely due to the relatively recent development of the dissatisfaction and frustration constructs, our search simply did not find as many studies that separately reported dissatisfaction or frustration results, compared to studies reporting on satisfaction or satisfaction combined with dissatisfaction or frustration (see Table 2). Because we could not control for the differential effect of satisfaction versus frustration, we refrained from conducting a moderation test for different types of well-being outcomes. When the literature has accumulated comparable numbers of effect sizes for satisfaction and frustration of autonomy, it would be interesting to examine these differential effects in further studies.

Similarly, the number of studies included in the current analysis was relatively small, and as shown in the posterior power analysis, the capacity of the current literature to test

for moderation effects remains limited. While we did have nearly 100% confidence that there were no medium- or large-sized differences between the Eastern and Western populations, we did not have sufficient power to detect small differences. Therefore, at this point, the non-significance in the moderation effect is best interpreted as a lack of support for cultural moderation, not as a definitive conclusion of a null effect. Future studies should continue examining this issue.

The current study is also constrained to focus on autonomy generally experienced in life, while SDT proposes that the importance of needs applies to all levels of psychological experience. Future research (empirical research, as well as reviews) assessing the effects of autonomy by examining domain-specific and moment-to-moment experiences may be helpful. By only including studies in the US and East Asia, which are the prototypes of Western individualistic and Eastern collectivist cultures, respectively, our study did not directly address the role of autonomy on well-being in other cultures (e.g., European), and future studies will help to generalize the conclusion of the current research by including other cultures. Finally, the research included in the current study is also correlational in nature, and another future direction is to apply longitudinal and experimental methods to infer causality in the role of autonomy across cultures.

These results do have implications for cultural practices beyond academia. For example, the Chinese government has long discredited the existence of any “universal values” as a Western ideological conspiracy (e.g., “Yishi Xingtai” 2013). Our findings support the argument that there are universal values important for the happiness of all people, Eastern and Western alike. Many other studies have noted the importance of supporting autonomy at all levels of social context (Deci and Ryan 2012; Yu et al. 2016), namely, for parents to be more attentive to the internal regulation of their children (e.g., Joussemet et al. 2008), teachers to use more student-centered instructions (e.g., Reeve and Jang 2006), organizations to place less emphasis on hierarchies (e.g., Vansteenkiste et al. 2007), and the society at large to adopt less control and more democracy (e.g., Downie et al. 2007). If the ultimate goal of society is to promote the happiness of the people, as Wen, the ex-Premier of China so righteously identified (Li 2010b), it is imperative that we incorporate autonomy as a core value to design more humanistic social structures in the future.

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Note: An asterisk indicate the studies included in our meta-analysis

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