

# Causal Ordering of Basic Psychological Needs and Well-Being

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**Abstract** What is the relationship between well-being and satisfaction of basic psychological needs overtime? The basic psychological needs theory is a subtheory of the self-determination theory that elaborates the concept of psychological needs and its relations to psychological health and well-being. The goals of this research was to establish the causal ordering between basic psychological needs and three psychological well-being indicators (subjective well-being, self-esteem and satisfaction with life), in a longitudinal study. We used a cross-lagged two-wave design. A total of 272 university students completed the questionnaire at the beginning and at the end of the semester. Relatedness at time 1 ( $T_1$ ) had a positive and significant effect on all well-being indicators at time 2 ( $T_2$ ); competence ( $T_1$ ) had a positive and significant effect on all indicators except for self-esteem ( $T_2$ ); finally, autonomy ( $T_1$ ) did not have a significant effect on any of the well-being indicators ( $T_2$ ). In conclusion, we confirm the causal ordering of competence and relatedness on well-being, according to the basic psychological needs subtheory. Universities, in general, and teachers, in particular, should promote relations between students and support the need of competence.

**Keywords** Self-determination theory · Basic psychological needs · Cross-lagged · Well-being · Life satisfaction · Self-esteem · Vitality

## 1 Introduction

What is the relationship between well-being and satisfaction of basic psychological needs overtime? One of the psychological theories that provide a means to satisfy basic psychological needs and promote the well-being of students is the self-determination theory (SDT; Deci and Ryan 2000; Ryan and Deci 2000a). The basic psychological needs theory (BPNT) is a subtheory of the SDT framework that elaborates the concept of psychological

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needs and its relations to well-being. This relationship is established theoretical and empirical level, however it has not been examined by means of a causal ordering study, considered an appropriate analytical approach to establish causal relationships (Marsh et al. 1999).

BPNT assumes that for humans to function and develop optimally, three psychological needs must be satisfied: autonomy, competence, and relatedness (Deci and Ryan 1985, 1991; Ryan and Deci 2000b). The need for autonomy refers to the desire to be self-initiating in the regulation of one's actions and to be the origin of one's behaviors. The need for competence implies that individuals want to interact effectively with their environment in order to feel competent at producing desired outcomes and preventing undesired ones. Finally, the need for relatedness pertains to the desire to feel connected with, and mutually supportive of, significant others (Lavigne et al. 2011; Ryan et al. 1994).

Deci and Ryan (2000) consider the fulfillment of the three psychological needs to be essential in the promotion and maintenance of both hedonic and eudaimonic well-being (Ryan and Deci 2001). Hedonic well-being has been described as the experience of happiness and pleasure (Diener 1994). Eudaimonic well-being refers to an individual achieving an integrated sense of self and realizing their human potential in terms of optimal psychological growth and development (Ryan and Deci 2001). The scientific literature has considered various indicators of hedonic (e.g. satisfaction with life) and eudaimonic well-being (e.g. subjective vitality and self-esteem). Satisfaction with life refers to the overall assessment that an individual makes about his own life (Pavot et al. 1991). Researchers consistently show that life satisfaction correlates in expected ways with biological markers of positive thoughts, feelings, and reward seeking, relevant behavior such as smiles and laughter, and the generation of and responsiveness to positive life events (Diener et al. 1999). Subjective vitality was developed within the SDT framework to encompass this eudaimonic definition of well-being (Ryan and Frederick 1997). It is defined as a state of high positive energy emanating from the self. Activities that satisfy basic psychological needs nourish the self, which would be manifest in the form of maintained or enhanced vitality. The connections between vitality and varied health and wellness outcomes make vitality an important focus of research (Ryan and Deci 2008). Self-esteem is defined as a positive or negative orientation toward oneself, which consists of feelings and qualitative judgments (Rosenberg 1979). Self-esteem refers to the general sense of personal worth (Harter 1985). Self-esteem has been presented as a fundamental feature in the research on mental health, well-being and social adaptation (Fox 1997, 2000). In academic context, Martín-Albo et al. (2009) used it as an indicator of self-esteem in an explanatory model based on self-determination theory in order to explain college students' well-being.

As stated above, the satisfaction of autonomy, competence, and relatedness leads to a wide variety of positive outcomes. This fact has also been studied by longitudinal analyses, in which the accumulation of these experiences over time predicts health and wellness outcomes. For example, Sheldon and Krieger (2007) studied how the difference in the three needs across a three-year period affected the difference in subjective well-being (SWB). They observed that each need had a positive and significant effect on SWB. In another study, Sheldon and Elliot (1999) assessed two indicators of SWB and the three basic psychological needs at the beginning of a semester, and measured SWB again at the end of the semester. They also asked, at three different times during the semester, how autonomous, competent and related they felt during some activities. Via a structural equation model the authors observed that a composite of the basic psychological needs at time 1 predicted the SWB at the same time point, and this had an effect on SWB at time 2,

which was mediated by the composite of the students' feelings of autonomy, competence and relatedness during the semester. This study shed some light on the relations between these two constructs, but did not analyze the reciprocal effect of SWB on the basic psychological needs required to be able to establish causality (MacCallum and Austin 2000).

### 1.1 Study Aims and Hypotheses

The purpose of this study was to examine the relationships between basic psychological needs and well-being over time in a higher education context. We consider that this study is relevant because we intend to show the causal ordering of the three basic psychological needs considered separately and three psychological well-being indicators (subject vitality, self-esteem and life satisfaction). In addition, according to Marsh (2002), most causal ordering research are performed in US, Australia and Canada, so it is important to evaluate the cross-cultural support for the generalizability of reciprocal effects model in other countries. We accomplished this goal by using a cross-lagged two-wave design panel design—a design that has been frequently used to examine relationships between variables for which a reciprocal relationship is hypothesized (Marsh et al. 1999). We tested four hypotheses:

- H<sub>0</sub>: Basic psychological needs do not have a positive effect on well-being, neither does well-being on basic psychological needs
- H<sub>1</sub>: Basic psychological needs have a positive effect on well-being, but well-being does not have a positive effect on basic psychological needs
- H<sub>2</sub>: Well-being has a positive effect on basic psychological needs, but basic psychological needs do not have a positive effect on well-being
- H<sub>3</sub>: Well-being and basic psychological needs have a reciprocal relationship: basic psychological needs predict well-being, and well-being predicts basic psychological needs

## 2 Method

### 2.1 Participants

A total of 422 students (60 male, and 362 female) completed the questionnaires at Time 1 (designated as T<sub>1</sub>) at the beginning of the second semester. The mean age was 21.57 years (SD = 4.97). Of the 422 participants, 272 students (40 male, and 232 female,  $M = 21.76$ ,  $SD = 5.17$ ) completed the questionnaire at Time 2 (designated as T<sub>2</sub>) 3 months later, at the end of the second semester in 2010–2011. They belonged to seven degrees taught at the (omitted for masked review). There were no potential ethnic differences, or grade differences, or variations in academic standing.

### 2.2 Procedure

We contacted the Dean of the Faculty to request permission and explain the details of the research. We explained to the students the goals of the study, and informed them that participation was voluntary and confidential, to avoid the possible effect of social

desirability. The surveys were administered in paper pencil format in class. One researcher was present during the administration of the instruments, and provided students with the necessary support to successfully complete the instruments.

## 2.3 Measures

### 2.3.1 Basic Psychological Needs

To measure the basic psychological need of autonomy, competence and relatedness, we used a Spanish adaptation (León et al. 2011) of the *Échelle de Satisfaction des Besoins Psychologiques* (Gillet et al. 2008). It consists of 5 items for autonomy (e.g. “I have the feeling of doing things right”), 5 for competence (e.g. “Often I do not feel very competent”) and 3 for relatedness (e.g. “I get along with people I come into contact with”). Responses were evaluated according to a Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*) points.

### 2.3.2 Well-Being

**2.3.2.1 Subjective Vitality** To assess subjective vitality, we used the Spanish version (Balaguer et al. 2005) of the Subject Vitality Scale (Ryan and Frederick 1997). It consists of seven items, six positively worded (e.g. “I feel full of energy”) and one negatively worded. The items were evaluated according to a Likert scale of seven points from 1 (*strongly disagree*) to 7 (*strongly agree*). To avoid acquiescence, the item that had been initially drafted negatively was modified and worded in a positive way.

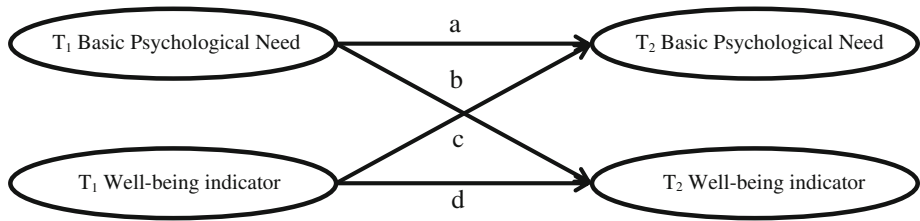
**2.3.2.2 Self-Esteem** We used the Spanish version of the Rosenberg Self-Esteem scale (Martín-Albo et al. 2007). This instrument is one-dimensional and consists of 10 items (e.g. “Overall I am satisfied with myself”), five positively worded and five negatively worded. The items are evaluated according to a Likert scale of four points, from 1 (*strongly disagree*) to 4 (*strongly agree*).

**2.3.2.3 Satisfaction with Life** Satisfaction with life was assessed by means of the Spanish version of the Satisfaction With Life Scale (SWLS) of Diener et al. (1985), as validated by Núñez et al. (2010). This scale consists of five items that assess global satisfaction with life (e.g. “I am satisfied with my life”). The answers were expressed in a Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

## 2.4 Data Analysis

### 2.4.1 Preliminary Analyses

We performed a descriptive analysis for each variable used in the study, calculating the mean, standard deviation, skewness, and kurtosis. We also analyzed the internal consistency of the instruments at each moment, using ordinal alpha (Elosua and Zumbo 2008), in order to verify their reliability. We carried CFAs to test the factor structure of all the used instruments. Finally, we analyzed the factor loadings and to test the meaning of the items at T1 and T2 (Fig. 1).



**Fig. 1** Reciprocal model of basic psychological need, and well-being

### 2.4.2 Cross-Lagged Models

Zapf et al. (1996), among others, have reviewed the relative strengths and weaknesses of various forms of longitudinal analyses, and according to their recommendations, we will use fully cross-lagged panel models. The hypotheses were tested by using structural equation models treating data as categorical with the weighted least squares mean and variance adjusted estimator (WLSMV). The null hypotheses would be supported if parameters b and c were not significant. If path b, but not c, was significant, then H<sub>1</sub> (basic psychological needs predict changes in well-being) would be supported. If path c, but not path b, was significant, then H<sub>2</sub> (well-being predicts changes in basic psychological needs) would be supported. Finally, if both paths b and c were significant, then H<sub>3</sub> (reciprocal effects) would be supported.

We tested three series of models, with three models in each series. In the first series, the well-being variable was subjective vitality. In the second series, the well-being variable was self-esteem; in the third, it was life satisfaction. In the models of each series, we used item scores to form a latent variable, namely autonomy (model 1), competence (model 2) and relatedness (model 3). The uniqueness term associated with each observed score at time 1 was allowed to correlate with the same term at time 2 (Bollen 1989).

Model fit was assessed using several fit criteria:  $\chi^2$  test and the next indexes: the Tucker-Lewis index (TLI), the comparative fit index (CFI), and the Weighted Root Mean Square Residual (WRMR). To perform the analysis we used Mplus 6.11 (Muthen and Muthen 2011), and PASW 19 for the descriptive statistics and reliability analysis.

## 3 Results

### 3.1 Preliminary Analyses

Table 1 presents the descriptive statistics (mean, standard deviation, skewness, and kurtosis) and ordinal alpha of each of the variables of the study. The skewness and kurtosis of each one of the variables was lower than 1. In addition, the ordinal alpha values of the diverse variables ranged between .84 for the basic psychological need of autonomy at T<sub>0</sub> and .95 for life satisfaction at T<sub>1</sub>, which indicates evidence of the reliability of the scales used. Table 2 shows that the strongest relationship was observed between autonomy and competence ( $r = .72$ ), and the weakest relationship was observed between relatedness and self-esteem ( $r = .28$ ). About the attrition, MANOVA showed that the non-responder scored significantly lower than the responder in all variables except for self-esteem.

**Table 1** Statistics, ordinal alpha and loadings range

Variable	<i>M</i>	SD	Skewnes	Kurtosis	Alpha ordinal	Loadings range
<i>T</i> <sub>1</sub>						
Autonomy	5.10	1.00	−.30	−.52	.84	.67, .75
Competence	5.21	.95	−.40	.00	.89	.72, .83
Relatedness	5.68	1.09	−1.07	.94	.89	.83, .89
Subjective vitality	5.14	1.06	−.24	−.41	.94	.69, .91
Self-esteem	3.25	.51	−.40	.26	.90	.66, .88
Life satisfaction	5.60	1.00	−.62	−.41	.88	.67, .93
<i>T</i> <sub>2</sub>						
Autonomy	4.91	1.01	−.15	−.25	.86	.69, .84
Competence	5.13	.99	−.31	.23	.93	.82, .87
Relatedness	5.41	1.09	−.58	.00	.92	.88, .94
Subjective vitality	4.98	1.20	−.28	−.28	.95	.74, .96
Self-esteem	3.32	.55	−.36	.04	.94	.71, .94
Life satisfaction	5.53	1.04	−.72	.33	.92	.77, .96

**Table 2** Time 1 and Time 2 correlations

Variable	1	2	3	5	6	7
1 Autonomy	–	.72	.49	.38	.35	.41
2 Competence	.70	–	.54	.61	.49	.52
3 Relatedness	.50	.49	–	.31	.42	.42
5 Subjective vitality	.41	.54	.33	–	.61	.63
6 Self-esteem	.38	.63	.28	.59	–	.55
7 Life satisfaction	.38	.43	.32	.58	.48	–

Time 1 correlations listed below the diagonal; time 2 correlations are above the diagonal. All correlations were significant ( $p < .01$ ).  $N = 272$

### 3.2 Confirmatory Factor Analysis

#### 3.2.1 Basic Psychological Needs

At  $T_1$ , the  $\chi^2$  test and the fit indexes were  $\chi^2(272, 62) = 259.75$  ( $p = .00$ ), CFI = .96, TLI = .94, and WRMR = 1.04. At  $T_2$ , the  $\chi^2$  test and the fit indexes for the three-factor solution were  $\chi^2(272, 62) = 340.42$  ( $p = .00$ ), CFI = .96, TLI = .95, and WRMR = 1.08. Factor loadings were between .67 and .88 at  $T_1$ , and between .68 and .94 at  $T_2$ .

#### 3.2.2 Subject Vitality

At  $T_1$ , the  $\chi^2$  test and the fit indexes were  $\chi^2(216, 14) = 130.17$  ( $p = .00$ ), CFI = .99, TLI = .98, and WRMR = .90. At  $T_2$ , they were  $\chi^2(216, 14) = 170.85$  ( $p = .00$ ), CFI = .99, TLI = .98, and WRMR = 1.09. Factor loadings were between .69 and .91 at  $T_1$  and between .74 and .96 at  $T_2$ .

### 3.2.3 Self-Esteem

At T<sub>1</sub>, the  $\chi^2$  test and the fit indexes were  $\chi^2(216, 5) = 69.80$  ( $p = .00$ ), CFI = .97, TLI = .95, and WRMR = 1.16. And at T<sub>2</sub>, they were  $\chi^2(216, 5) = 50.41$  ( $p = .00$ ), CFI = .99, TLI = .98, and WRMR = .81. Factor loadings were between .66 and .88 at T<sub>1</sub> and between .71 and .94 at T<sub>2</sub>.

### 3.2.4 Satisfaction with Life

At T<sub>1</sub>, the  $\chi^2$  test and the fit indexes were  $\chi^2(216, 5) = 10.09$  ( $p = .00$ ), CFI = .99, TLI = .99, and WRMR = .32. And at T<sub>2</sub>, they were  $\chi^2(216, 5) = 11.72$  ( $p = .00$ ), CFI = .99, TLI = .99, and WRMR = .34. Factor loadings were between .67 and .93 at T<sub>1</sub> and between .77 and .96 at T<sub>2</sub>.

## 3.3 Cross-Lagged Models

As seen in Table 3, basic psychological needs and the well-being indicators at time 1 had, in all models, a positive and significant effect on the same latent variable at time 2. In the models in which autonomy were used at time 1, no significant cross effect was found in any of the well-being indicators at time 2; while in the models where competence and relatedness were used a time 1, a cross effect was found in all the well-being indicators at time 2 except for the model where the latent variables were competence at time 1 and self-esteem at time 2. No effects of time 1 well-being on time 2 basic psychological needs were significant. As regards the fit indexes of all the models, although the  $\chi^2$  value was significant in all models, fit indexes showed acceptable values. All models were over-identified.

## 4 Discussion

The purpose of this study was to examine the relationship between basic psychological needs and well-being over time in a higher education context. In general, results indicated that the relationship between basic psychological needs and well-being was different depending on the type of the basic psychological need assessed and the well-being indicator.

Overall, results of models 2 (competence), and 3 (relatedness) rejected the null hypothesis (basic psychological needs do not have a positive effect on well-being, and well-being does not have a positive effect on basic psychological needs) because all effects differed significantly from zero, except for competence on self-esteem. In model 1 (autonomy) we did not reject the null hypothesis, because there were no significant cross effects. Results can be explained following Bollen's (1989) statements about causality, in which he points out that in order to prove causality you need to assess the cause and, after a time interval, assess the consequence, but if this interval is too long or too narrow you may miss the effects. It is possible that the three-month interval used in this study might have hidden the effect of autonomy.

Analyses of competence and relatedness models provided support for H<sub>1</sub>: Basic psychological needs have a positive effect on well-being, but well-being does not have a positive effect on basic psychological needs. Competence and relatedness are significant predictors of well-being, except for the effect of competence on self-esteem; this non-significance could be due to the small sample size used. No well-being indicator at time 1

**Table 3**  $\chi^2$  value, fit indexes and effects of the cross lagged models

Model	$\chi^2$	DF	p	CFI	TLI	WRMR	T <sub>1</sub> BPN → T <sub>2</sub> BPN (a)	p	T <sub>1</sub> BPN → T <sub>2</sub> WB (b)	p	T <sub>1</sub> WB → T <sub>2</sub> BPN (c)	p	T <sub>1</sub> WB → T <sub>2</sub> WB (d)	p
<i>1. Autonomy</i>														
Vitality	560.19	234	.00	.99	.98	1.02	.69	.00	.04	.46	.02	.61	.74	.00
Self-esteem	362.09	159	.00	.98	.97	1.03	.67	.00	.04	.49	.02	.75	.75	.00
Life satisfaction	319.28	154	.00	.98	.97	.89	.70	.00	.01	.85	.00	.90	.79	.00
<i>2. Competence</i>														
Vitality	610.23	174	.00	.98	.98	.99	.66	.00	.16	.00	-.04	.53	.78	.00
Self-esteem	345.35	154	.00	.98	.98	.88	.68	.00	.12	.08	.05	.58	.72	.00
Life satisfaction	367.58	159	.00	.98	.97	.93	.69	.00	.12	.02	-.01	.91	.79	.00
<i>3. Relatedness</i>														
Vitality	463.75	154	.00	.99	.98	.98	.56	.00	.15	.00	.08	.06	.75	.00
Self-esteem	204.81	90	.00	.99	.98	.83	.56	.00	.14	.02	.01	.82	.75	.00
Life satisfaction	143.22	90	.00	.99	.99	.63	.55	.00	.15	.01	.06	.20	.77	.00

DF degrees of freedom. BPN basic psychological needs, WB well-being



was a significant predictor of competence, or relatedness at time 2. These findings are in line with the BPNT proposals that the satisfaction of the basic psychological need of competence, and relatedness leads to positive outcomes like psychological well-being. Likewise, they are consistent with the views of Ryan and Deci (2008), and the results found by Sheldon and Krieger (2007), Sheldon and Elliot (1999) and Patrick et al. (2007) in an academic context.

As for hypothesis 2 (H<sub>2</sub>: Well-being has a positive effect on basic psychological needs, but basic psychological needs do not have a positive effect on well-being), and hypothesis 3 (H<sub>3</sub>: Well-being and basic psychological needs have a reciprocal relationship, basic psychological needs predict well-being, and well-being predicts basic psychological needs), we found as follows. In all models we did not observed a significant effect of a well-being indicator on a psychological basic need, so we cannot accept these hypotheses. This is in line with the BNT statements, because well-being is a consequence of the basic psychological needs.

Results indicate that the basic psychological needs of competence and relatedness predict changes in well-being after a three-month interval. A student, who at the beginning of a semester, interacts effectively with his or her environment and feels connected and supportive with other students, will experience a higher vitality, self-esteem, and life satisfaction at the end of the semester. This result provides evidence concerning the causal ordering of this relationship. Another keypoint is that, in a classroom where at the beginning of the semester the teacher behaves in an energetic way, tries to understand the students, is flexible, offers different options to carry out work, the students' autonomy might be satisfied. However, as time passes and the teacher needs to evaluate them and, thus, may not satisfy student's autonomy, leading to a decrease in this factor, and making students rely more on other needs in order to try to keep their well-being status.

It is important to highlight that the direction of causality between basic psychological needs and well-being has important practical implications in academic context. Universities, in general, and teachers, in particular, should promote relations between students and support the need of competence. The university should implement teacher training courses to learn how to engender climates and conditions that promote mutual work and cooperation between students. Teachers should make appropriate use of reinforcement and expectations in order to satisfy the need of competence, enhancing the students' effectiveness to achieve positive changes in well-being over time.

#### 4.1 Limitations and Future Perspectives

First of all, because of the basic psychological needs, malleability, the three-month interval used in the academic context might have been too long. Future researchers should take different time intervals into consideration. The cross effects observed in this study should be interpreted with caution since other variables (e.g. autonomy support, different types of motivation) may directly or indirectly affect the students, well-being. Future studies should incorporate other variables in order to provide more evidence of the validity of the model. Although in the present study, psychological well-being was assessed following the positive psychology view (Seligman and Csikszentmihalyi 2000), that is assessing self-esteem, life satisfaction and subject vitality, in the future the effect of the basic psychological needs on negative outcomes such as negative emotions or anxiety could be explored. The conclusions we have reached could thus be extended and completed. A last limitation that should be highlighted is the sample size; we believe that a bigger sample size might be closer to the true population values. In particular, the university population in

the chosen degrees predominantly consisted of female students, so we should be careful about generalizing these results to the general population.

## 4.2 Conclusions

We would like to highlight that we assessed the basic psychological needs and well-being in this study using Likert scales; with this kind of instruments data is usually treated as continuous, but we treated them as ordered categorical because of the more accurate estimation of the standard error, which does not convey us to believe that some parameters are significant, when they are not (Muthén and Kaplan 1985). Also, although well-being indicators tend to behave in a similar way in all models, it is important to point out that, because we analyzed them in a separate way, we were able to see that the effect of the basic psychological needs was different. We hold that this is a richer approach when we want to study this effect. Lastly, the performance of a longitudinal study has allowed us to examine the effect of the changes produced over time. Thanks to the type of design used, we confirm the causal ordering within the BPN statements, which allows us to confidently assert that the basic psychological needs of competence and peer relationships lead to well-being.

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