

# Measuring Need Satisfaction and Frustration in Educational and Work Contexts: The Need Satisfaction and Frustration Scale (NSFS)

Ylenio Longo · Alexander Gunz · Guy J. Curtis · Tom Farsides

Published online: 20 November 2014  
© Springer Science+Business Media Dordrecht 2014

**Abstract** The satisfaction and frustration of the psychological needs for autonomy, relatedness and competence predict well-being and ill-being outcomes. However, research within educational and work contexts is stifled by the lack of an exhaustively validated measure. Following extensive preparatory and pilot work, the present three studies (total  $N = 762$ ) aimed to develop such a measure and validate it against the Basic Need Satisfaction at Work Scale (Deci et al. in *Personal Soc Psychol Bull* 27(8):930–942, 2001) and an adapted version of the Balanced Measure of Psychological Needs (Sheldon and Hilpert in *Motivation Emot* 36(4):439–451, 2012). The Need Satisfaction and Frustration Scale demonstrated a better factor structure and internal reliability than its predecessors, and good criterion validity. This improvement was due to the exclusion of ambiguous items and items measuring antecedents of need satisfaction and frustration. The results also strengthen current evidence showing that need satisfaction and frustration are distinct but related constructs, and each better predicts well-being and psychological health problems, respectively.

---

The portions of this article served as Ylenio Longo master's dissertation.

---

Y. Longo · T. Farsides  
Department of Psychology, University of Sussex, East Sussex, UK

*Present Address:*

Y. Longo (✉)  
Division of Psychiatry and Applied Psychology, School of Medicine, University of Nottingham,  
YANG Fujia Building, Jubilee Campus, Nottingham NG8 1BB, UK  
e-mail: yleniolongo@gmail.com

A. Gunz  
Manchester Business School, University of Manchester, Manchester, UK

G. J. Curtis  
School of Psychology and Exercise Science, Murdoch University, Perth, Australia

**Keywords** Need satisfaction · Need frustration · Need thwarting · Autonomy · Competence · Relatedness · Measurement

## 1 Introduction

Basic Needs Theory (Deci and Ryan 1985, 2000; Ryan and Deci 2002), a mini-theory of self-determination theory, has been enormously influential over the past 15 years. A Web of Science search conducted in December 2013 revealed that Deci and Ryan's (2000) article alone has been cited in over two thousand subsequent publications. Despite this remarkable interest, few of the existing scales designed to measure need satisfaction have been subject to proper testing. Furthermore, careful examination reveals that there are theoretical concerns with items included in many of the scales (e.g. Johnston and Finney 2010). The inadequacy of currently used measures is made yet more acute by the recent findings showing that need frustration has different effects than mere lack of need satisfaction (e.g. Bartholomew et al. 2011b). Few scales attempt to measure need frustration, let alone do so satisfactorily.

Reliable and valid measurement tools are critical for the conduct of science. When we use items that do not accurately tap into the construct they are supposed to measure, these introduce random error variance in our estimates. Because of this, the relationship between our predictors and outcomes may be underestimated—an effect known as “regression dilution” or “regression attenuation” (Frost and Thompson 2000; Fuller 1987). Poorly selected items can thus create false null findings, or underestimates of effect sizes. Worse, items that inadvertently tap into related constructs, to a greater or lesser extent, can add systematic error. This can bias estimates either downwards *or* upwards, inflating the risk not just of type 1 errors (from attenuated relationships, as above), but also of type 2 errors, in which false associations are found. Given the very large numbers of published studies measuring basic psychological needs, even a small marginal increase in error rates could be responsible for entering a significant absolute number of inaccurate results into this literature.

The present paper fills this gap by developing and extensively validating a new measure with appropriate psychometric and predictive properties, measuring both need satisfaction and frustration in occupational and educational domains.

### 1.1 Basic Psychological Needs

Basic needs theory posits that individuals possess three innate psychological needs which, when satisfied, provide the nutrients necessary for psychological growth and well-being. First, autonomy consists in experiencing a sense of choice and perceiving one's behavior as freely chosen, rather than controlled by external forces. Second, the need for competence involves feeling effective in one's activities, and capable of mastering challenges and attaining desired outcomes. Third, relatedness consists in feeling close and connected to others, feeling a sense of belongingness, caring for and feeling cared for by others. According to basic needs theory, satisfying these three needs can promote well-being, while frustrating one or all of these needs may undermine it (Deci and Ryan 2000; Ryan and Deci 2002). While many studies have supported the association between need

satisfaction and well-being (e.g. Church et al. 2013; Deci et al. 2001), few have investigated the effects of need frustration.

Newer research suggests that need frustration is not merely the absence of need satisfaction, but a distinct construct with different effects on people's health and motivation. It can be conceptualized as the personal experience of deprivation of each need (Deci and Ryan 2000). Bartholomew et al. (2011a, b) found need satisfaction to better predict well-being outcomes (e.g. vitality, positive affect), and need frustration to better predict ill-being outcomes, such as emotional exhaustion, negative affect and depression. Furthermore, Sheldon and Gunz (2009) found that need frustration, but not need satisfaction, predicted individuals' motivation to satisfy each need.

The studies above focused, respectively, on need frustration within a sport context and in life in general. However, the measurement of need frustration within educational and work contexts has been considerably neglected. Furthermore, current education- and work-related measures exhibit several limitations, which are discussed next.

## 1.2 Current Measures

### 1.2.1 Education- and Work-Related Measures

Following a literature review, four education-related measures of psychological needs were identified: Filak and Sheldon (2003), Minnaert et al. (2011), Reeve and Sickenius (1994), and Standage et al. (2005). However, none of these scales aimed to measure need frustration, and three of them included a limited number of negatively-worded items (Filak and Sheldon 2003; Standage et al. 2005; Minnaert et al. 2011). Below, we explain why negatively-worded items may be an inadequate measure of need frustration. Furthermore, with one exception (Reeve and Sickenius 1994), the studies did not exhaustively examine the construct validity of the scales through exploratory and confirmatory factor analyses.

As far as work-related measures are concerned, three scales were identified: the Basic Psychological Needs at Work Scale (BPNWS, Brien et al. 2012), the Work-related Basic Need Satisfaction scale (W-BNS, Van den Broeck et al. 2010), and the Basic Need Satisfaction at Work Scale (BNSW-S,<sup>1</sup> Deci et al. 2001). However, these questionnaires may not accurately measure need frustration, and present limited evidence of their psychometric properties.

First, the BPNWS does not include any need frustration items and the final W-BNS does not include any competence frustration items. Furthermore, the W-BNS and the BNSW-S typically attempt to measure need frustration by including negatively phrased items of need satisfaction, like "I don't really feel connected with other people at my job" (Van den Broeck et al. 2010). However, participants may be confused if they have to express agreement to positively- and negatively-worded items. Indeed, as a sound psychometric practice, it is best to avoid using negatively-worded items (De Vaus 2002).

Second, few of these measures have been subject to suitable statistical tests of validity and dimensionality. Even though an English translation was provided, the W-BNS and the BPNWS have only been validated in Dutch and French, respectively, which limits their current usefulness in English-speaking samples. On the other hand, while the BNSW-S has been widely used (Self-Determination Theory 2013), it has often been modified (e.g. Baard

<sup>1</sup> The BNSW-S and the BNSL-S were retrieved from the website, <http://www.psych.rochester.edu/SDT/questionnaires.php>, which is maintained by E. Deci and R. Ryan from the University of Rochester. It should be noted that the website is subject to change.

et al. 2004; Ilardi et al. 1993; Kasser et al. 1992; La Guardia et al. 2000) and its dimensionality has yet to be empirically studied. Two studies (Johnston and Finney 2010; Sheldon and Hilpert 2012) analyzed the dimensionality of a scale *derived* from the BNSW-S (i.e., the Basic Need Satisfaction in Life Scale, BNSL-S (see footnote 1), which was adapted to measure need satisfaction in life in general—Gagné 2003). These articles identified several issues with the content validity of its items, (discussed below), which may also negatively impact the BNSW-S. However, the issues identified with the dimensionality of the BNSL-S may not apply to the work-related BNSW-S, as the factor structure of a scale may change when it is applied in different contexts (Johnston and Finney 2010).

Third, there are theoretical reasons to believe that some of the items in both education- and work-related scales may not fully capture satisfaction of the specific needs they are attempting to measure, which makes the lack of empirical validation on them particularly worrying.

Some items seem to tap into more constructs than just need satisfaction. For example, the item “I enjoyed the challenges this class has provided” (Filak and Sheldon 2003) is coded as a competence item. However, it could also tap into task enjoyment. Other items can be identified as tapping into more than one need (Johnston and Finney 2010). For example, the item “My feelings are taken into consideration at work” supposedly measures autonomy, yet it is also consistent with the definition of relatedness. Similarly, the item “I feel pressured at work” could be coded as a competence item or an autonomy item. Other items describe needs in overly vague terms. For example, Minnaert et al. (2011) include the item “Right now, the team spirit is high” as a measure of relatedness. Finally, other items are overly specific. For example, Brien et al. (2012) deconstruct the need for relatedness into feeling heard, trusting co-workers, etc. However, deconstructing a need into specific subcomponents is not consistent with the purposes of basic needs theory, which aims to present a parsimonious framework (Deci and Ryan 1985; Ryan and Deci 2000).

In summary, there are concerns that many of the items used in education- and work-related scales may not fully capture the content they are attempting to measure. In light of this, it is particularly concerning that the empirical dimensionality of these scales has rarely been scrutinized. Furthermore, while research suggests that need frustration and need satisfaction are qualitatively different, most scales only measure the latter.

### 1.2.2 Domain-General Measures

Although the present paper focuses on education- and work-related need satisfaction and frustration, in the absence of adequate domain-specific measures, domain-general measures could be adapted to fit a specific population. Therefore, a brief review of domain-general measures is appropriate.

A confirmatory factor analysis by Johnston and Finney (2010) indicated that the Basic Need Satisfaction in Life Scale (BNSL-S, Gagné 2003) exhibits some dimensionality issues. Adequate model fit was achieved only after eliminating several items and with the inclusion of a negative-item valence (or method) factor. However, after this elimination process the scale did not include enough items to adequately measure need frustration. Further, three negatively-scored items were better explained by their valence factor than their need factor. In order to overcome some of these issues, Sheldon and Hilpert (2012) developed the Balanced Measure of Psychological Needs (BMPN). The new scale exhibited a better fit than the BNSL-S, after including two valence factors (or method

factors) for need satisfaction and frustration. However, five items of the BMPN, again, appeared to be better explained by their valence factor than by their need factor.

### 1.2.3 Antecedents of Need Satisfaction

Another fundamental issue was found in both domain-specific and domain-general scales: the inclusion of items tapping into antecedents of need satisfaction and frustration. While environmental conditions can contribute to the satisfaction or frustration of a need, the need itself can only be defined “with respect to the person’s actual functioning” (Deci and Ryan 1985, p. 39). For example, competence satisfaction can improve as a *result* of succeeding or receiving positive feedback, but success and positive feedback will not provide an accurate account of one’s perceived competence satisfaction (Deci and Ryan 1985).

Current scales consistently include some items measuring need-supportive or unsupportive conditions rather than need satisfaction and frustration. For example, the BNSW-S item, “People at work tell me I am good at what I do,” is coded as a competence item. However, workers may feel incompetent despite the praise of colleagues (Van den Broeck et al. 2010). In this case, they will agree with this statement even though they perceive their need for competence has not been satisfied. Similarly, the BMPN item “There were people telling me what I had to do” is coded as an autonomy frustration item. However, receiving directions does not necessarily undermine one’s need for autonomy, which can be satisfied as long as one endorses other people’s requests (Ryan and Deci 2002; Van den Broeck et al. 2010). Finally, the BMPN item “I had disagreements and conflicts with people I usually get along with” is coded as a relatedness frustration item. However, having some disagreements does not necessarily cause one to feel rejected or lonely (indeed, robust discussion and debate are regarded as bonding activities by some people), and this BMPN item exhibited a very low loading on its relatedness factor (Sheldon and Hilpert 2012).

Including items such as the ones reported above can also be problematic because certain environmental conditions have been found to influence more than one need. For example, in several studies, autonomy support was found to affect the satisfaction of all three needs (e.g. Adie et al. 2012; Baard et al. 2004). Therefore, including items tapping into antecedents of need satisfaction in a scale of need satisfaction may reduce its content validity and, perhaps, negatively impact its factor structure.

## 1.3 Aims

The purpose of this paper is twofold: to build on previous research by developing and validating a measure of need satisfaction and frustration in education and at work, and also to scrutinize the structural validity of two other important existing measures. The BMPN is tested because it is currently the most valid measure of need satisfaction and frustration in life in general, and it can easily be adapted for samples of both students and workers. The BNSW-S is also included because it has been widely used in work-related studies, but its dimensionality has not yet been exhaustively tested.

Johnston and Finney (2010) and Sheldon and Hilpert (2012) showed that, only after including method factors, adequate model fit could be achieved with the BNSL-S and BMPN, even though several items did not exhibit adequate factor loadings on their need factors. Furthermore, in the past, multitrait-multimethod models have often produced illogical parameter estimates as well as issues of convergence (e.g. Kenny and Kashy 1992; Marsh and Bailey 1991). These findings suggest that, structural equation models must

account for both satisfaction and frustration of each need. However, they also indicate that a multitrait-multimethod model may not be an ideal way to test the dimensionality of these scales. Even though a multitrait-multimethod model may fit the data well by accounting for the satisfaction and frustration of each need, adequate fit indices may conceal problematic estimates and items that do not adequately measure the need they are supposed to measure.

Therefore, in the present studies, a new model is proposed that distinguishes between the satisfaction and frustration of each need, not through method factors, but by specifying six factors—one for the respective satisfaction and frustration of each of the three needs: autonomy, relatedness, and competence. These six factors are then linked through three higher order need factors and two higher-order valence factors (for need satisfaction and frustration).

Based on current findings and arguments, the following hypotheses were formulated:

**Hypothesis 1** The new and the old scales of need satisfaction and frustration will exhibit a better fit with a model accounting for both different needs and valence (i.e. satisfaction and frustration).

**Hypothesis 2** Due to the inclusion of ambiguous items and items tapping into antecedents of need satisfaction, previous scales will exhibit a lower internal reliability and a poorer factor structure with a higher-order model than the newly developed scale.

**Hypothesis 3** In the context of sports, Bartholomew et al.'s (2011a, b) found that the satisfaction and frustration of each need better predicted well-being and ill-being outcomes, respectively. We expect a similar pattern in education- and work-related contexts.

## 2 Scale Development

### 2.1 Development of the Item Pool

The development process for the items in the new Need Satisfaction and Frustration Scale (NSFS) was adapted from Clark and Watson (1995). First, definitions of the three basic psychological needs were acquired from the theoretical literature (Deci and Ryan 1985, 2000; Ryan and Deci 2002). To identify previous measures, the first author searched PsycINFO and Google Scholar using variations of the following search terms: *psychological needs, self-determination, autonomy, competence, relatedness, need satisfaction, need frustration, need thwarting*, together with the terms *scale, questionnaire* and *measure*. Articles were excluded if they were not written in English or were not published in peer-reviewed journals. Scales were excluded if they appeared not to be grounded in self-determination theory.

Based on the definitions, items were selected from published scales of need satisfaction and frustration. Although the original aim was mainly to use items from existing scales without revising them, this was rarely possible, because of the issues that have been previously outlined. As a result, a total of 64 items were selected from previous questionnaires, and 62 of these were adapted to fit the purposes of the present scale. Additionally, in order to ensure that each subscale exhaustively measured each aspect of a need, 20 new items were developed based on the theoretical literature. The first and last authors collaborated in this process. All the resulting 84 items were phrased as declarative statements.

## 2.2 Conceptual Item Support

Five experts on the topic were contacted through their university email address and asked to assess the content validity of the item pool. They were presented with two online tasks. Firstly, they were provided with the definitions of each need and a randomized list of items. They indicated to what extent each item measured each of the three needs on a scale from 1 (strongly disagree) to 5 (strongly agree). Furthermore, they indicated if any of the items seemed ambiguous. An item was retained when the experts identified it as measuring only its corresponding need (with a rating of 4 or 5), and not a different one (with ratings of 3 or lower). Based on the ratings, 59 of the original 84 items were retained with no modifications, 9 were modified and 16 items were omitted. In the second task, the items were ordered based on the construct they measured (e.g. autonomy), and the experts were asked whether all aspects of the construct were represented. Responses to the latter task were all positive.

## 2.3 Pilot 1

The 68 selected items were randomized and administered to a sample of 107 university students (64 women), studying psychology ( $N = 67$ ), engineering ( $N = 26$ ), and chemistry ( $N = 14$ ). Participants were asked to complete a paper-and-pencil questionnaire at the end of one of their classes. Items were preceded by the stem “In university-related activities...” and were scored on a 1 (strongly disagree) to 7 (strongly agree) Likert scale. Participants were also asked to circle any item that seemed confusing. Three items were found to be confusing by more than one participant and were omitted from further analyses. The stem “In university-related activities...” was also confusing for some participants and was later changed to “In my studies...”.

The Short form Marlowe-Crowne 2(10) social desirability scale (Strahan and Gerbasi 1972) was used to ensure the selected items were not strongly related to social desirability, ( $\alpha = .63$ ). The BMPN (Sheldon and Hilpert 2012) was also included for a preliminary assessment of the criterion validity of the selected items. Reliability for satisfaction and frustration BMPN subscales was .67 and .39 for autonomy, .74 and .68 for competence, and .85 and .67 for relatedness.

Thirty items from the item pool were skewed (critical ratios  $>3$ ), particularly those measuring relatedness. However, in order not to reduce each subscale to fewer than 4 items, only the 19 items with the highest skewness scores were omitted at this stage. The remaining skewed items would later be modified to reduce extreme scores. After carrying out a correlational analysis, 11 more items were excluded based on a high number of non-significant correlations with other items measuring the same need. No evidence of multicollinearity (e.g.  $r > .8$ ) was found. Finally, in order to reach an approximate balance between satisfaction and frustration items, 7 more items exhibiting the lowest item-total correlations were removed.

None of the selected items was significantly correlated to social desirability. All items exhibited moderate to strong correlations with their respective BMPN subscales ( $r_s > .31$  and  $< .69$ ). Because of its low reliability, the BMPN autonomy frustration subscale was omitted from the analysis.

Following the first pilot, the questionnaire comprised 11 items measuring relatedness, 8 measuring competence and 9 items measuring autonomy. Most items were modified to avoid issues of skewness: qualifiers were added to increase or reduce the intensity of a statement (e.g. “always” and “sometimes”). Interestingly, items measuring relatedness



satisfaction appeared to be skewed because most respondents agreed that they felt connected to “some people”. Therefore, these items were modified by broadening their focus to “people in general”. For example, the item “I feel some people I interact with really care about me” (critical ratio >5) was modified to “I feel the people I interact with really care about me.”

Furthermore, to ensure that sufficient items were included and that each subscale had an equal number of satisfaction and frustration items, 6 new items were generated based on theory. As a result, the scale comprised 12 items measuring autonomy, 10 items measuring competence, and 12 items measuring relatedness. Fewer competence items were generated because all items in the competence subscale showed better item-total correlations than those in the other subscales.

## 2.4 Pilot 2

A second pilot test, involving 32 engineering students, was carried out to ensure that the item modifications just described did not alter the correlations among items. Results of a correlational analysis revealed only few issues: one relatedness item seemed redundant, as it was highly correlated ( $r \geq .8$ ) with two other items, one autonomy item was very poorly correlated to most other items, and another item was found to be confusing by several participants. These problematic items were deleted. Furthermore, three new items were generated and one competence item was modified to improve its correlation with the other items on the competence subscale.

## 3 Study 1

The aim of Study 1 was to select adequate items for the Need Satisfaction and Frustration Scale (NSFS) through principal components analysis (PCA). Based on previous studies (e.g. Van den Broeck et al. 2010; Bartholomew et al. 2011a, b) items were hypothesized to load on three factors corresponding to the three needs in basic needs theory.

### 3.1 Method

#### 3.1.1 Measure

Participants answered the 34 items selected for the new NSFS. Items were grouped for each need, rather than being randomly distributed. Using a grouped format has been shown to improve convergent and discriminant validity (Schriesheim et al. 1989).

#### 3.1.2 Participants and Procedure

The sample comprised 163 students (106 women) from the University of Sussex. Their age ranged from 18 to 55 years, with a mean of 23 ( $SD = 4.95$ ). They studied a wide range of subjects, including psychology (39 %), development (7 %), economics (6 %), business (4 %), and law (3 %). Most participants ( $N = 112$ ) were native speakers of English. Participants were recruited online through email and social networking advertisements, were asked to complete an online questionnaire and were compensated with an opportunity to win a £25 prize.



### 3.2 Results

Missing data did not exceed 1.2 % for any single item, and were missing completely at random: Little's MCAR  $X^2(385) = 411.04, p = .173$ . Before conducting a principal components analysis (PCA), items were scanned for restricted range, low variability, high skewness, low correlations, and redundancy. Twelve items (four items for each subscale) were removed due to a high skewness (critical ratios  $>3$ ), or several weak correlations ( $r < .3$ ) with other items measuring the same need.

The remaining 22 items were subjected to PCA. Missing values were excluded pairwise. Bartlett's test indicated that the data were suitable for PCA,  $X^2(231) = 1,763.92, p < .001$ , and the Kaiser–Meyer–Olkin measure suggested that the sample size was adequate for this specific analysis (.847). The first 6 eigenvalues (and % of variance accounted for) were 6.36 (28.9 %), 3.31 (15.04 %), 2.52 (11.45 %), 1.46 (6.63 %), 1.07 (4.85 %) and .87 (3.94 %). Results of parallel analysis showed that a three- or four-factor solution might be appropriate. Ninety five percent of random datasets had eigenvalues for the fourth factor only slightly lower (1.46 and 1.38) than the fourth eigenvalue in the current dataset (1.46). Similarly, the scree plot indicated that three or four factors could be retained. Based on theory (Deci and Ryan 2000) and past research (e.g. Bartholomew et al. 2011a, b), three factors were extracted using an oblique rotation (Direct Oblimin).

All initial factor loadings exceeded .5. In order to further optimize the length of the scale to 3 items per subscale, 4 items were omitted. Whenever two items measured the same facet of a need (e.g. feeling cared for) and exhibited comparable factor loadings, the one with more complex wording was omitted. After conducting a PCA including only the final 18 items (see Table 1), both parallel analysis and the scree plot favored a 3-factor solution. All items clearly loaded on their factor, with a minimum pattern loading of .6, and no cross-loadings above .22.

Internal reliability coefficients for NSFS satisfaction and frustration subscales respectively were .81 and .70 for autonomy, .85 and .77 for relatedness, and .81 and .82 for competence.

### 3.3 Discussion

In Study 1, the 18-item Need Satisfaction and Frustration Scale was developed. Three factors, corresponding to the three needs in basic needs theory, were extracted and each factor comprised three satisfaction and three frustration items. All items exhibited robust and discriminating loadings, and all subscales showed adequate internal consistency.

## 4 Study 2

The aim of Study 2 was to analyze the dimensionality of the NSFS and the BMPN, assess whether the NSFS exhibits a better factor structure than the BMPN, and present evidence of criterion validity with intrinsic motivation, and other indicators of psychological well-being and ill-being.

When Sheldon and Hilpert (2012) analyzed the BMPN, a multitrait-multimethod model, which accounted for the satisfaction and frustration of each need, fit the data better than a 3-factor needs model, which only accounted for the three needs, or a 2-factor valence model, which only accounted for satisfaction and frustration. Therefore, the authors concluded that each of the three needs has separate satisfaction and frustration dimensions. However, with a multitrait-multimethod model, five BMPN items were better explained by their valence (or

**Table 1** Items and factor loadings for the Need Satisfaction and Frustration Scale (NSFS in Study 1)

	Pattern coefficients			Structure coefficients		
	C	R	A	C	R	A
I doubt whether I am able to carry out my tasks properly	<b>-.837</b>	-.019	.049	<b>-.825</b>	-.231	-.242
I sometimes feel unable to master hard challenges	<b>-.780</b>	.048	-.024	<b>-.776</b>	-.161	-.285
Occasionally, I feel incapable of succeeding in my tasks	<b>-.750</b>	.060	-.021	<b>-.742</b>	-.140	-.269
I feel highly effective at what I do	<b>.738</b>	.112	.043	<b>.783</b>	.314	.316
I feel I am very good at the things I do	<b>.732</b>	.082	.023	<b>.761</b>	.278	.289
I feel I can accomplish even the most difficult tasks	<b>.696</b>	-.031	.028	<b>.698</b>	.156	.263
I feel I'm perfectly integrated into a group	-.086	<b>.906</b>	-.051	.134	<b>.874</b>	.075
I feel very close and connected with other people	-.008	<b>.778</b>	-.019	.190	<b>.773</b>	.113
I feel the people I interact with really care about me	-.030	<b>.735</b>	.041	.178	<b>.735</b>	.157
Sometimes, I feel a bit rejected by others	-.038	<b>-.707</b>	-.087	-.254	<b>-.732</b>	-.222
On occasions, I feel people are a bit cold towards me	.033	<b>-.687</b>	-.083	-.176	<b>-.693</b>	-.190
I feel a bit alone when I'm with other people	-.219	<b>-.605</b>	.116	-.338	<b>-.643</b>	-.064
I feel free to decide what to do	.006	-.097	<b>.825</b>	.264	.047	<b>.810</b>
I feel I'm given a lot of freedom in deciding how I do things	-.048	.023	<b>.806</b>	.235	.149	<b>.793</b>
I feel I am prevented from choosing the way I carry out tasks	.080	-.045	<b>-.751</b>	-.191	-.153	<b>-.731</b>
I feel completely free to make my own decisions	.003	.086	<b>.734</b>	.279	.213	<b>.750</b>
I feel forced to follow directions regarding what to do	-.099	-.075	<b>-.661</b>	-.346	-.215	<b>-.708</b>
I feel under pressure to follow standard procedures	-.132	.086	<b>-.604</b>	-.318	-.053	<b>-.635</b>

C competence, R relatedness, A autonomy. The initial stem for each item was "In my studies..."

Bold values indicate loadings over .35

method) factor than by their need factor. For example, the item "I had disagreements or conflicts with people I usually get along with" loaded highly on the frustration factor (.68) but lowly on the relatedness factor (.23). In other words, five BMPN items measured general satisfaction or frustration better than they measured their respective need (e.g. relatedness). Furthermore, in previous studies, multitrait-multimethod models have been shown to produce illogical parameter estimates (e.g. Kenny and Kashy 1992; Marsh and Bailey 1991). Therefore, even though a multitrait-multimethod model may fit the data well by accounting for the satisfaction and frustration of each need, adequate fit indices may conceal problematic estimates and items that do not adequately measure the need they are supposed to measure.

The present study tried to improve on this by accounting for the satisfaction and frustration of each need with a higher-order model. This used six separate factors to capture the six individual need components (i.e., autonomy satisfaction and frustration, relatedness satisfaction and frustration, and competence satisfaction and frustration). These six factors were then linked through three higher-order need factors and two higher-order valence factors. It was expected that the data would better fit a model accounting for the satisfaction and frustration of each of the three needs, than it would a simpler three-factor model that only accounted for the three needs, or a two-factor model that only accounted for need satisfaction and frustration (Sheldon and Hilpert 2012). In addition, due to its problematic factor loadings (Sheldon and Hilpert 2012), it was expected that the BMPN

would exhibit a poorer fit with this new higher-order model than the NSFS, whose items loaded highly on their respective need factors in Study 1.

Based on previous studies, the three needs were expected to be correlated to vigor and exhaustion (Van den Broeck et al. 2010; Vansteenkiste et al. 2007; Vander Elst et al. 2012), positive and negative affect (Mack et al. 2011; Meyer et al. 2007; Milyavskaya et al. 2009; Sheldon and Filak 2008), anxiety and depression (Bartholomew et al. 2011a; Deci et al. 2001; Meyer et al. 2007; Vansteenkiste et al. 2006), and intrinsic motivation (Brien et al. 2012; Standage et al. 2005). Furthermore, based on findings by Bartholomew et al. (2011a, b), need satisfaction was expected to correlate more strongly with well-being outcomes, while need frustration was expected to correlate more strongly with psychological health problems.

## 4.1 Method

### 4.1.1 Participants and Procedure

The participants were 356 university students (265 women). Ages ranged from 17 to 62 ( $M = 24$ ,  $SD = 7.51$ ). Participants studied a variety of subjects including psychology (66 %), criminology (5 %), business-related subjects (3 %), and law (3 %). Furthermore, most respondents (85 %) were native English speakers.

One hundred and fifty three British students, recruited online through email and social networking advertisements, were asked to complete an online questionnaire and were compensated with an opportunity to win a £25 prize. Two hundred and three Australian students were recruited through a participant database at Murdoch University and undergraduate students received partial credit toward research participation requirements. Students were also recruited via advertising on university learning management systems, by direct email to class groups, and via snowball sampling.

### 4.1.2 Measures

*Basic needs* were measured with the 18-item Need Satisfaction and Frustration Scale (NSFS) and the 18-item Balanced Measure of Psychological Needs (BMPN, Sheldon and Hilpert 2012). The scales were presented on two separate pages and the NSFS was completed first. In both the NSFS and the BMPN, the items were preceded by the stem "In my studies..." BMPN items were scored on a 1 (no agreement) to 5 (much agreement) scale. Reliabilities for the subscales of the two measures can be seen in Table 2. Close inspection reveals that, consistent with hypothesis 2, in almost every case the NSFS scale showed greater reliability.

**Table 2** Reliability alpha estimates for subscales of the NSFS and BMPN in Study 2

Need component	NSFS (new scale)	BMPN (Sheldon and Hilpert 2012)
Autonomy satisfaction	.82	.59
Autonomy frustration	.70	.52
Relatedness satisfaction	.76	.82
Relatedness frustration	.75	.61
Competence satisfaction	.87	.80
Competence frustration	.80	.79

**Vigor** The 5-item vigor subscale of the Utrecht Work Engagement Scale for students (UWES-S, Schaufeli et al. 2002a) was used as a measure of engagement. Items such as “When I study, I feel like I am bursting with energy” are scored on a 7-point frequency scale ranging from never to always, ( $\alpha = .83$ ).

**Exhaustion** The 5-item exhaustion subscale from the Maslach Burnout Inventory—Student Survey (MBI-SS, Schaufeli et al. 2002a) was used as a measure of burnout. Items such as “I feel burned out from my studies” are scored on a 7-point frequency scale ranging from never to always, ( $\alpha = .88$ ).

**Affect** The frequency of positive and negative affect was assessed through the 12-item Scale of Positive and Negative Experience (SPANE, Diener et al. 2010). Participants consider to what extent, over the past 4 weeks, they experienced several feelings during their studies, on a scale from 1 (very rarely or never) to 5 (very often or always). Six items (e.g. happy) measured positive affect ( $\alpha = .88$ ) and 6 items (e.g. sad) measured negative affect ( $\alpha = .87$ ).

**Anxiety/depression** were measured with the 4-item Anxiety-Depression subscale from the 12-item General Health Questionnaire (GHQ, Goldberg and Williams 1988; Shevlin and Adamson 2005). Respondents indicate how frequently they have experienced anxiety and depression symptoms (e.g. “Have you recently lost much sleep over worry?”) on a 4-point scale ( $\alpha = .85$ ).

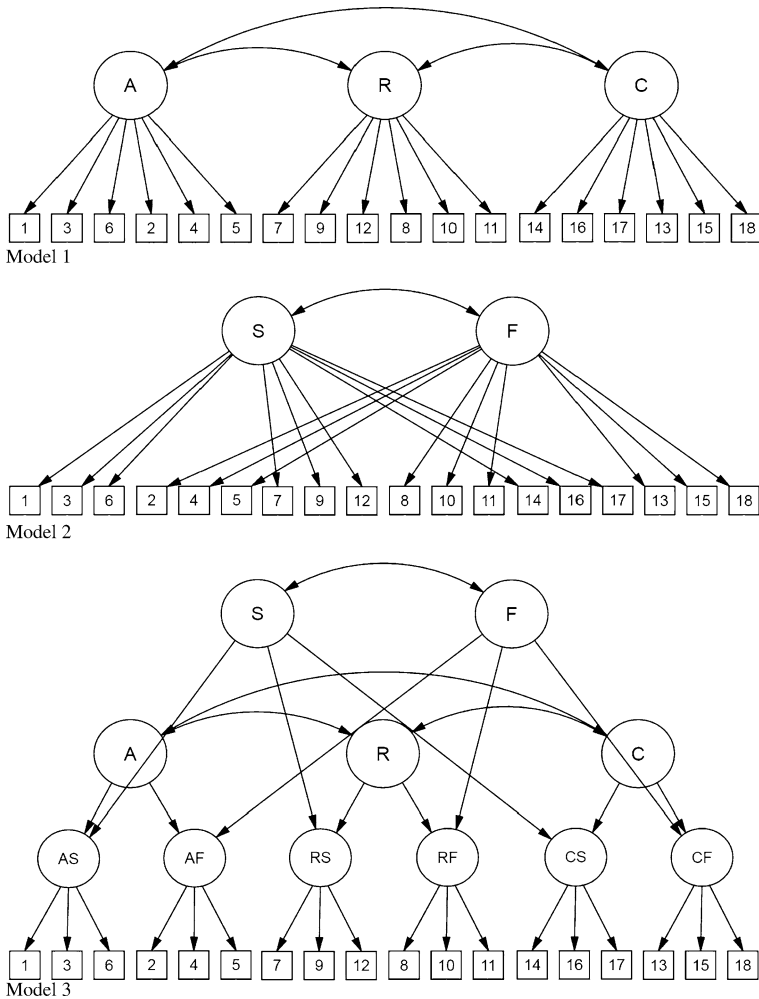
**Intrinsic Motivation** The 3-item intrinsic motivation subscale of the Motivation at Work Scale (MAWS, Gagné et al. 2010) was used to assess intrinsic motivation and was slightly adapted for a student sample. The instructions stated the following: “Please indicate for each of the following statements to what degree they presently correspond to one of the reasons for which you are doing these specific studies.” Items such as “Because I enjoy these studies very much” are rated on a 1 (not at all) to 7 (exactly) scale, ( $\alpha = .89$ ).

## 4.2 Results

Preliminary analyses showed mild deviations from normality, which were not deemed problematic (Curran et al. 1996): absolute skewness <1.13, kurtosis <1.22. Partial data was not missing completely at random (Little’s MCAR  $X^2(3,013) = 3,239.40, p = .002$ ). However, this was proportionately small: only a single motivation item had more than 3 % missing values (specifically 3.1 %). Therefore, any potential effect on the overall results was likely to be minuscule.

### 4.2.1 Factor Structure

A confirmatory factor analysis (CFA) was carried out with AMOS 19, using full-information maximum likelihood to account for partial data. An illustration of the model structures analyzed can be found in Fig. 1. Model 1 contains three correlated need factors. Model 2 includes two correlated valence factors for need satisfaction and frustration. Model 3 includes six factors (one for the satisfaction and one for the frustration of each of the three needs) as well as three correlated higher-order need factors for autonomy,



**Fig. 1** Hypothesized CFA models. *A* autonomy, *R* relatedness, *C* competence, *S* satisfaction, *F* frustration. *Item numbers* correspond to item numbers in the “Appendix”

relatedness and competence, and two higher-order valence factors for need satisfaction and frustration.

Several indices of goodness of fit were included to evaluate model fit: the Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA) and the Akaike Information Criterion (AIC). General guidelines suggest that values higher than .90 for TLI and CFI indicate good fit, and values above .95 indicate excellent fit (Brown 2006; Stevens 2009). RMSEA values below .05 indicate good fit, values in the .05 to .08 range indicate acceptable fit (Browne and Cudeck 1992) and values above 1 indicate poor fit (Kline 2011). AIC is typically used to compare the fit of competing models, and lower values indicate better fit (Brown 2006).

For the NSFS (see Table 3), best overall fit was found with model 3. Model 1 had poor fit, and model 2 did not fit the data. For the BMPN, model 3 had acceptable fit, and models 1 and 2 did not fit the data. Furthermore, an analysis of the parameter estimates for model 3

**Table 3** Summary of goodness of fit indices for NSFS and BMPN models in Study 2

Scale	Model	$\chi^2$	<i>df</i>	TLI	CFI	RMSEA (90 % CI)	AIC
NSFS	1. Correlated needs	548.17***	132	.798	.844	.094 (.086–.102)	662.17
	2. Correlated valence	1,185.54***	134	.498	.607	.149 (.141–.157)	1,295.54
	3. Higher-order needs and valence	268.69***	125	.926	.946	.057 (.048–.066)	396.69
BMPN	1. Correlated needs	705.14***	132	.644	.725	.111 (.103–.119)	819.14
	2. Correlated valence	715.45***	134	.644	.721	.111 (.103–.119)	825.45
	3. Higher-order needs and valence	310.22***	125	.879	.911	.065 (.056–.074)	438.22

\*\*\*  $p < .001$

revealed that two BMPN items loaded poorly onto their factors (.39), while all NSFS items showed reasonable factor loadings (overall estimates between .60 and .89). In other words, hypotheses 1 and 2 were supported, as both scales exhibited a better fit with a model accounting for both different needs and valence (i.e. satisfaction and frustration), but the NSFS had better fit results than the BMPN with this model on all indices.

#### 4.2.2 Criterion Validity

Correlations between each NSFS subscale and its respective BMPN subscale ranged from moderate (i.e. autonomy satisfaction:  $r = .40$ ) to high (i.e. competence frustration:  $r = .66$ ). A correlational analysis was also carried out among each of the six NSFS subscales and various indicators of well-being and psychological health problems (see Table 4). Finally, structural equation modeling was used to test whether need satisfaction predicted well-being better than need frustration and, vice versa, whether need frustration predicted ill-being better than need satisfaction (hypothesis 3). The standardized path coefficients of the resulting model (see Fig. 2) reinforce the argument that need satisfaction and need frustration better predict positive and negative outcomes, respectively.

#### 4.3 Discussion

The results show that need satisfaction better predicted well-being outcomes, while need frustration better predicted psychological health problems. This supports the criterion validity of the scale, and further extends Bartholomew's et al.'s (2011a, b) findings from the sports to the education domain. Goodness of fit indices and parameter estimates indicated that a six-factor model with higher-order needs and valence factors fits the NSFS data better than the BMPN data. Furthermore, all NSFS subscales exhibited adequate internal reliability, whereas three of the six BMPN subscales exhibited several reliabilities below .70.

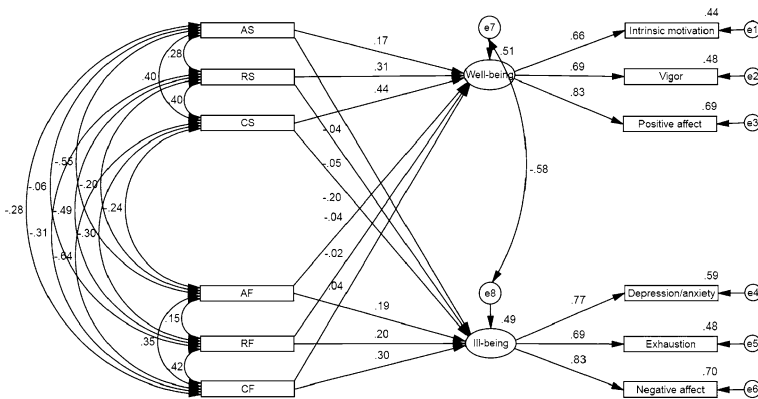
### 5 Study 3

In past studies, the same factor structure for constructs such as engagement and burnout was found in both educational and occupational domains (Schaufeli et al. 2002a, b). Therefore, it was deemed appropriate to test the validity of the NSFS in an occupational sample. Study 3

**Table 4** Correlations between need satisfaction and frustration, and students' well-being, psychological health problems and intrinsic motivation (NSFS in Study 2)

	Vigor	Exhaustion	Positive affect	Negative affect	Anxiety-depression	Intrinsic motivation
Autonomy satisfaction	.26***	-.20***	.38***	-.32***	-.23***	.26***
Autonomy frustration	-.18**	.28***	-.28***	.35***	.30***	-.14**
Relatedness satisfaction	.35***	-.26***	.47***	-.32***	-.28***	.34***
Relatedness frustration	-.25***	.33***	-.25***	.35***	.38***	-.24***
Competence satisfaction	.47***	-.38***	.50***	-.48***	-.40***	.40***
Competence frustration	-.35***	.44***	-.38***	.52***	.44***	-.23***

\*\*  $p < .01$ , \*\*\*  $p < .001$



**Fig. 2** Predicting well-being and ill-being outcomes (NSFS), Study 2.  $X^2(32) = 98.71$ ,  $p < .001$ , Comparative Fit Index (CFI) = .960, Root Mean Square Error of Approximation (RMSEA) = .077 (90 % CI = .060–.094). A autonomy, R relatedness, C competence, S satisfaction, F frustration

repeats the same hypotheses as study 2, but adds a measure of job satisfaction as a further indicator of well-being, based on findings by Van den Broeck et al. (2010). Furthermore, the BNSW-S (Deci et al. 2001) was included because its dimensionality has not yet been tested, even though the scale has been extensively used in the past.

5.1 Method

5.1.1 Participants and Procedure

Three hundred and three American participants were recruited to complete an online questionnaire through the Mechanical Turk website (for an evaluation of the properties of this participant population, see Buhrmester et al. 2011). In order to ensure high data quality, the completion times, IP addresses and employment status of respondents were analyzed. First, 48 cases completed in less than 4 min were omitted to ensure the participants dedicated sufficient time to the task. Second, 10 cases were omitted because they were duplicates originating from only 5 IP addresses. Finally, 2 cases from unemployed participants were omitted.



Cases from 243 participants (148 men) were retained. Ages ranged from 20 to 67 ( $M = 31.59$ ,  $SD = 9.05$ ). Tenure in current employment for 63 % of participants was 1 to 5 years, for 16 % it was 6 to 10 years, for 8 % it was 11 to 15 years, and for 8 % it was less than one year. Most participants (62 %) had an undergraduate degree, while 30 % had a postgraduate degree or equivalent. Furthermore, most participants (85 %) were in full-time employment while 15 % worked part-time. Each respondent was given a compensation of 20 cents USD.

### 5.1.2 Measures

*Basic needs* were measured with the Needs Satisfaction and Frustration Scale (NSFS), the Balanced Measure of Psychological Needs (BMPN, Sheldon and Hilpert 2012), and the Basic Needs Satisfaction at Work scale (BNSW-S, Deci et al. 2001). The scales were presented on separate pages in the same order as presented here. In both the NSFS and the BMPN, items were preceded by the stem “In my job...” Reliabilities for the subscales of the three measures can be seen in Table 5. Again, consistent with hypothesis 2, in almost every case the NSFS subscales showed greater reliability.

**Well-being and Ill-being** *Job satisfaction* was measured with Cammann et al. (1983) three-item scale. Items such as “All in all, I am satisfied with my job” are scored on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree), ( $\alpha = .85$ ). All other scales were the work-related equivalents of the measures used in study 2. *Vigor* was assessed with the 6-item vigor subscale of the Utrecht Work Engagement Scale (UWES, Schaufeli et al. 2002b; Schaufeli et al. 2006), ( $\alpha = .71$ ). *Exhaustion* was measured with the 5-item exhaustion subscale of the Maslach Burnout Inventory—General Survey (MBI-GS, Schaufeli et al. 1996), ( $\alpha = .89$ ). *Intrinsic motivation* was measured with the intrinsic motivation subscale of the Motivation At Work Scale (MAWS, Gagné et al. 2010), ( $\alpha = .90$ ). *Affect* was measured with the Scale of Positive and Negative Experience (SPAN, Diener et al. 2010). Participants consider to what extent, over the past 4 weeks, they experienced several feelings during their job. Reliability estimates for positive and ( $\alpha = .85$ ) negative ( $\alpha = .88$ ) affect were acceptable. *Anxiety and depression* were measured with the 4-item anxiety-depression subscale from the 12-item General Health Questionnaire (GHQ, Goldberg and Williams 1988; Shevlin and Adamson 2005), ( $\alpha = .85$ ).

## 5.2 Results

Preliminary analyses showed moderate deviations from normality, which were not deemed problematic (Curran et al. 1996): absolute skewness <1.54, kurtosis <2.58.

**Table 5** Reliability alpha estimates for subscales of the NSFS, BMPN and BNSW-S in Study 3

Need component	NSFS (new scale)	BMPN (Sheldon and Hilpert 2012)	BNSW-S (Deci et al. 2001)
Autonomy satisfaction	.81	.68	.69
Autonomy frustration	.82	.50	.48
Relatedness satisfaction	.73	.75	.81
Relatedness frustration	.78	.75	.60
Competence satisfaction	.76	.69	.66
Competence frustration	.82	.70	.67

### 5.2.1 Factor Structure

A confirmatory factor analysis (CFA) was carried out with AMOS 19. The same three models from study 2 were specified in the present study (see Table 6). Model 3 produced the best overall fit with all three scales, although fit indices were better with the NSFS and BMPN. Furthermore, model 2 showed poor fit with all three scales, and model 1 did not fit any scale.

An analysis of the parameter estimates for model 3 revealed high loadings for all NSFS items (between .64 and .83). On the other hand, both the BMPN and the BNSW-S included one autonomy frustration item with extremely low loadings (.11 and .18 respectively). All other BMPN items exhibited factor loadings between .49 and .77, while BNSW-S items had loadings between .33 and .75. Taken together, and in combination with the broadly superior internal reliability coefficients, these results suggest that the NSFS is the preferred scale.

### 5.2.2 Criterion Validity

Correlations between each NSFS subscale and its respective BMPN subscale ranged from .52 to .69, while correlations between NSFS subscales and BNSW-S subscales ranged from .51 to .67. Further, a correlational analysis was carried out relating the satisfaction and frustration of each need to the various indicators of well-being and psychological health problems (see Table 7). Hypothesis 3 was tested through a structural equation analysis: once again, the standardized path coefficients (see Fig. 3) reinforce the argument that need satisfaction and need frustration better predict positive and negative outcomes, respectively.

## 6 Discussion and General Discussion

The paper contributes to the research on basic psychological needs in several ways. First, it introduces a psychometrically sound measure of need satisfaction and frustration in

**Table 6** Summary of goodness of fit indices for NSFS, BMPN and BNSW-S models in Study 3

Scale	Model	$\chi^2$	<i>df</i>	TLI	CFI	RMSEA (90 % CI)	AIC
NSFS	1 Correlated needs	991.52***	132	.496	.565	.164 (.155–.174)	1,069.52
	2 Correlated valence	454.39***	134	.815	.838	.099 (.089–.110)	528.39
	3 Higher-order needs and valence	228.99***	125	.936	.947	.059 (.046–.071)	320.99
BMPN	1 Correlated needs	734.10***	132	.543	.606	.137 (.128–.147)	812.10
	2 Correlated valence	351.54***	134	.837	.858	.082 (.072–.092)	425.54
	3 Higher-order needs and valence	233.75***	125	.913	.929	.060 (.048–.072)	325.75
BNSW-S	1 Correlated needs	817.18***	186	.597	.643	.118 (.110–.127)	907.18
	2 Correlated valence	392.78***	188	.871	.884	.067 (.058–.076)	478.78
	3 Higher-order needs and valence	368.72***	179	.874	.893	.066 (.057–.076)	472.72

\*\*\*  $p < .001$

**Table 7** Correlations between need satisfaction and frustration, and workers' well-being, psychological health problems and intrinsic motivation (NSFS in Study 3)

	Job satisfaction	Vigor	Exhaustion	Intrinsic motivation	Positive affect	Negative affect	Anxiety-depression
Autonomy satisfaction	.58***	.54***	-.22**	.63***	.58***	-.34***	-.23***
Autonomy frustration	-.34***	-.15*	.56***	-.20**	-.28***	.48***	.49***
Relatedness satisfaction	.54***	.46***	-.26***	.48***	.53***	-.27***	-.24***
Relatedness frustration	-.34***	-.09	.61***	-.11	-.27***	.53***	.54***
Competence satisfaction	.42***	.41***	-.29***	.32***	.38***	-.27***	-.28***
Competence frustration	-.22***	-.09	.60***	-.04	-.14*	.46***	.54***

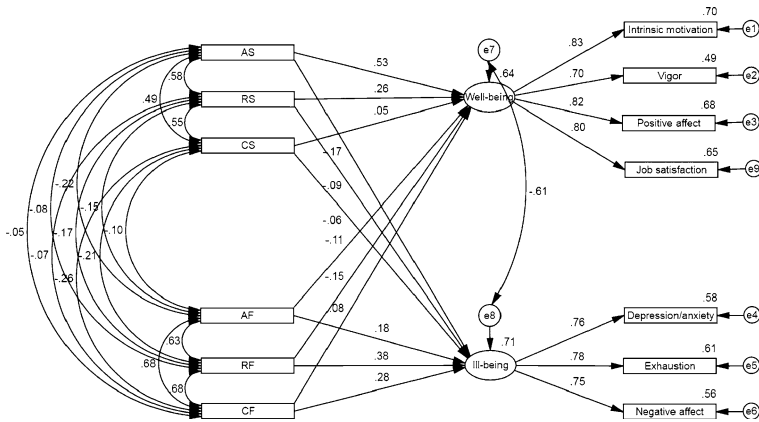
\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

educational and work contexts. Second, it evaluates the validity of two existing scales: a recent one (the BMPN), and an older one, which has been extensively used in previous work-related studies (the BNSW-S).

The results of Studies 2 and 3 indicate that the NSFS exhibits higher internal reliability and a better factor structure than its predecessors. Specifically, best fit was found in each scale with a model including six factors (representing the satisfaction and frustration of each of the three basic needs), three higher-order need factors and two higher-order valence factors. Furthermore, this model fit the NSFS better than its predecessors. This improvement in reliability and factor structure may be due to the rigorous procedures of content validation and item selection conducted before Study 2, which led to the elimination of many potentially problematic items. It must be noted that the improvement in model fit was stronger in the student sample (Study 2) than in the worker sample (Study 3), although the NSFS exhibited better factor loadings in both studies.

It seems that the inclusion of ambiguous items and items measuring antecedents of need satisfaction and frustration may have reduced the structural validity and internal reliability of the BMPN and especially the BNSW-S. A striking example of this can be found in the BMPN item "There are people telling me what I have to do," which had a loading of .39 (study 2) and .11 (study 3) on its autonomy frustration factor, and the BNSW-S item "When I am at work, I have to do what I am told," which had a loading of .18. Neither of these items accurately portrays autonomy frustration, as basic needs theory clearly states that receiving directions does not necessarily undermine one's need for autonomy, which can be satisfied as long as one endorses other people's requests (Ryan and Deci 2002). Another problematic BNSW-S item was "I pretty much keep to myself when I am at work," which had a loading of .33 on its relatedness frustration factor. This item describes a behavior that does not necessarily reflect an internal feeling of rejection or loneliness.

Third, the paper builds on past research by showing that need satisfaction and frustration best predict well-being and ill-being outcomes, respectively. This finding extends beyond the domain of physical exercise (e.g. Bartholomew et al. 2011a, b) to include also educational and work contexts.



**Fig. 3** Predicting well-being and ill-being outcomes (NSFS), Study 3.  $\chi^2 (43) = 117.81, p < .001$ , Comparative Fit Index (CFI) = .958, Root Mean Square Error of Approximation (RMSEA) = .085 (90 % CI = .067–.103). A autonomy, R relatedness, C competence, S satisfaction, F frustration

The main implication of these results is that the frustration of a need is not equal to a low level of satisfaction of that need. It is common practice in the SDT literature to measure need satisfaction by combining need satisfaction with reverse-scored need frustration items, and vice versa, to measure need frustration by combining need frustration and reverse-scored need satisfaction items (e.g. Van den Broeck et al. 2010; Vander Elst et al. 2012). Based on the present data, this may lead to an inaccurate assessment of the constructs as well as potentially misleading correlations with well-being and ill-being outcomes.

6.1 Limitations

There are three potential limitations in the studies above that should be acknowledged. First, since the data are correlational, causal relationships cannot be assumed. In order to test causal relationships, longitudinal or experimental designs would be required.

Second, the sample size for Pilot 2 was arguably small for validating changes to items derived from Pilot 1. However, several of these items performed well in subsequent studies. Although sample sizes were otherwise adequate for the purposes of each study (e.g. Tinsley and Tinsley 1987), the worker sample and the student samples are not necessarily representative of all workers or all university students. To strengthen the results, and further validate the NSFS, future studies could replicate Studies 2 and 3 with samples from different cultures, work environments and/or universities.

Third, as far as the BMPN is concerned, current results only involve its use within occupational and academic domains. The results should, therefore, not be generalized to its use as a measure of need satisfaction and frustration in life in general. However, future studies could develop and test an adapted version of the NSFS as a measure of need satisfaction and frustration in other domains and in life in general.

6.2 Conclusion

The present studies expanded on previous work on basic need theory (e.g. Bartholomew et al. 2011a, b; Sheldon and Hilpert 2012) and confirmed that need satisfaction and frustration are separate but related constructs, and each better predicts positive and

negative outcomes, respectively. Furthermore, the paper introduced a new scale of need satisfaction and frustration for work and educational domains that exhibits better internal reliability and structural validity than its predecessors. This was achieved by including items that more accurately tapped into their specific need and that focused on individual experiences of need satisfaction or frustration.

**Acknowledgments** The authors wish to acknowledge the assistance of Kennon Sheldon, Nikos Ntoumanis, Fernando A. Ortiz, Rod Bond, and Stephen Joseph in conducting this research.

## Appendix: The Need Satisfaction and Frustration Scale

Instructions: Please, read each of the following statements carefully. For each statement, use the scale below to circle the response that best represents your opinion.

Strongly disagree	Disagree	Slightly disagree	Neither disagree nor agree	Slightly agree	Agree	Strongly agree
1	2	3	4	5	6	7

Stem: In my studies.../In my job...

1. I feel I'm given a lot of freedom in deciding how I do things
2. I feel I am prevented from choosing the way I carry out tasks
3. I feel completely free to make my own decisions
4. I feel forced to follow directions regarding what to do
5. I feel under pressure to follow standard procedures
6. I feel free to decide what to do
7. I feel the people I interact with really care about me
8. Sometimes, I feel a bit rejected by others
9. I feel I'm perfectly integrated into a group
10. I feel a bit alone when I'm with other people
11. On occasions, I feel people are a bit cold towards me
12. I feel very close and connected with other people
13. I doubt whether I am able to carry out my tasks properly
14. I feel I am very good at the things I do
15. Occasionally, I feel incapable of succeeding in my tasks
16. I feel highly effective at what I do
17. I feel I can accomplish even the most difficult tasks
18. I sometimes feel unable to master hard challenges

Autonomy satisfaction: 1, 3, 6.

Autonomy frustration: 2, 4, 5.

Relatedness satisfaction: 7, 9, 12.

Relatedness frustration: 8, 10, 11.

Competence satisfaction: 14, 16, 17.

Competence frustration: 13, 15, 18.

## References

- Adie, J. W., Duda, J. L., & Ntoumanis, N. (2012). Perceived coach-autonomy support, basic need satisfaction and the well- and ill-being of elite youth soccer players: A longitudinal investigation. *Psychology of Sport and Exercise*, 13(1), 51–59. doi:10.1016/j.psychsport.2011.07.008.
- Baard, P. P., Deci, E. L., & Ryan, R. M. (2004). Intrinsic need satisfaction: A motivational basis of performance and well-being in two work settings. *Journal of Applied Social Psychology*, 34(10), 2045–2068. doi:10.1111/j.1559-1816.2004.tb02690.x.
- Bartholomew, K. J., Ntoumanis, N., Ryan, R. M., Bosch, J. A., & Thøgersen-Ntoumani, C. (2011a). Self-determination theory and diminished functioning: The role of interpersonal control and psychological need thwarting. *Personality and Social Psychology Bulletin*, 37(11), 1459–1473. doi:10.1177/0146167211413125.
- Bartholomew, K., Ntoumanis, N., Ryan, R. M., & Thøgersen-Ntoumani, C. (2011b). Psychological need thwarting in the sport context: Assessing the darker side of athletic experience. *Journal of Sport and Exercise Psychology*, 33(1), 75–102.
- Brien, M., Forest, J., Mageau, G. A., Boudrias, J. S., Desrumaux, P., Brunet, L., & Morin, E. M. (2012). The basic psychological needs at work scale: Measurement invariance between Canada and France. *Applied Psychology: Health and Well-Being*, 4(2), 167–187. doi:10.1111/j.1758-0854.2012.01067.x.
- Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. London: The Guilford Press.
- Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods and Research*, 21(2), 230–258. doi:10.1177/0049124192021002005.
- 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. doi:10.1177/1745691610393980.
- Cammann, C., Fichman, M., Jenkins, D., & Klesh, J. R. (1983). Assessing the attitudes and perceptions of organizational members. In S. Seashore, E. Lawler, P. Mirvis, & C. Camman (Eds.), *Assessing organizational change: A guide to methods, measures, and practices*. New York: Wiley.
- Church, A. T., Katigbak, M. S., Locke, K. D., Zhang, H., Shen, J., de Jesús Vargas-Flores, J., et al. (2013). Need satisfaction and well-being: Testing self-determination theory in eight cultures. *Journal of Cross-Cultural Psychology*, 44(4), 507–534. doi:10.1177/0022022112466590.
- Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment*, 7(3), 309–319. doi:10.1037/1040-3590.7.3.309.
- Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods*, 1(1), 16–29. doi:10.1037/1082-989X.1.1.16.
- De Vaus, D. (2002). *Surveys in social research*. Crows Nest: Allen & Unwin.
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum Press.
- 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. doi:10.1207/S15327965PLI1104\_01.
- Deci, E. L., Ryan, R. M., Gagné, M., Leone, D. R., Usunov, J., & Kornazheva, B. P. (2001). Need satisfaction, motivation, and well-being in the work organizations of a former eastern bloc country: A cross-cultural study of self-determination. *Personality and Social Psychology Bulletin*, 27(8), 930–942. doi:10.1177/0146167201278002.
- Diener, E., Wirtz, D., Tov, W., Kim-Prieto, C., Choi, D. W., Oishi, S., & Biswas-Diener, R. (2010). New well-being measures: Short scales to assess flourishing and positive and negative feelings. *Social Indicators Research*, 97(2), 143–156. doi:10.1007/s11205-009-9493-y.
- Filak, V. F., & Sheldon, K. M. (2003). Student psychological need satisfaction and college teacher-course evaluations. *Educational Psychology*, 23(3), 235–247. doi:10.1080/0144341032000060084.
- Frost, C., & Thompson, S. (2000). Correcting for regression dilution bias: Comparison of methods for a single predictor variable. *Journal of the Royal Statistical Society Series A*, 163, 173–190. doi:10.1111/1467-985X.00164.
- Fuller, W. A. (1987). *Measurement error models*. New York: Wiley.
- Gagné, M. (2003). The role of autonomy support and autonomy orientation in prosocial behavior engagement. *Motivation and Emotion*, 27(3), 199–223. doi:10.1023/A:1025007614869.
- Gagné, M., Forest, J., Gilbert, M. H., Aubé, C., Morin, E., & Malorni, A. (2010). The Motivation at Work Scale: Validation evidence in two languages. *Educational and Psychological Measurement*, 70(4), 628–646. doi:10.1177/0013164409355698.

- Goldberg, D. P., & Williams, P. (1988). *A user's guide to the General Health Questionnaire*. Windsor, UK: NFER-Nelson.
- Ilardi, B. C., Leone, D., Kasser, T., & Ryan, R. M. (1993). Employee and supervisor ratings of motivation: Main effects and discrepancies associated with job satisfaction and adjustment in a factory setting. *Journal of Applied Social Psychology*, 23(21), 1789–1805. doi:10.1111/j.1559-1816.1993.tb01066.x.
- Johnston, M. M., & Finney, S. J. (2010). Measuring basic needs satisfaction: Evaluating previous research and conducting new psychometric evaluations of the Basic Needs Satisfaction in General Scale. *Contemporary Educational Psychology*, 35(4), 280–296. doi:10.1016/j.cedpsych.2010.04.003.
- Kasser, T., Davey, J., & Ryan, R. M. (1992). Motivation and employee-supervisor discrepancies in a psychiatric vocational rehabilitation setting. *Rehabilitation Psychology*, 37(3), 175–188. doi:10.1037/h0079104.
- Kenny, D. A., & Kashy, D. A. (1992). Analysis of the multitrait-multimethod matrix by confirmatory factor analysis. *Psychological Bulletin*, 112(1), 165–172. doi:10.1037/0033-2909.112.1.165.
- Kline, R. B. (2011). *Principles and practice of structural equation modeling*. New York: The Guilford Press.
- La Guardia, J. G., Ryan, R. M., Couchman, C. E., & Deci, E. L. (2000). Within-person variation in security of attachment: A self-determination theory perspective on attachment, need fulfillment, and well-being. *Journal of Personality and Social Psychology*, 79(3), 367–384. doi:10.1037/0022-3514.79.3.367.
- Mack, D. E., Wilson, P. M., Oster, K. G., Kowalski, K. C., Crocker, P. R., & Sylvester, B. D. (2011). Well-being in volleyball players: Examining the contributions of independent and balanced psychological need satisfaction. *Psychology of Sport and Exercise*, 12(5), 533–539. doi:10.1016/j.psychsport.2011.05.006.
- Marsh, H. W., & Bailey, M. (1991). Confirmatory factor analyses of multitrait-multimethod data: A comparison of alternative models. *Applied Psychological Measurement*, 15(1), 47–70. doi:10.1177/014662169101500106.
- Meyer, B., Enström, M. K., Harstveit, M., Bowles, D. P., & Beevers, C. G. (2007). Happiness and despair on the catwalk: Need satisfaction, well-being, and personality adjustment among fashion models. *The Journal of Positive Psychology*, 2(1), 2–17. doi:10.1080/17439760601076635.
- Milyavskaya, M., Gingras, I., Mageau, G. A., Koestner, R., Gagnon, H., Fang, J., & Boiché, J. (2009). Balance across contexts: Importance of balanced need satisfaction across various life domains. *Personality and Social Psychology Bulletin*, 35(8), 1031–1045. doi:10.1177/0146167209337036.
- Minnaert, A., Boekaerts, M., de Brabander, C., & Opendakker, M. C. (2011). Students' experiences of autonomy, competence, social relatedness and interest within a CSCL environment in vocational education: The case of commerce and business administration. *Vocations and Learning*, 4(3), 175–190. doi:10.1007/s12186-011-9056-7.
- Reeve, J., & Sickenius, B. (1994). Development and validation of a brief measure of the three psychological needs underlying intrinsic motivation: The AFS scales. *Educational and Psychological Measurement*, 54(2), 506–515. doi:10.1177/001316449054002025.
- Ryan, R. M., & Deci, E. L. (2000). The darker and brighter sides of human existence: Basic psychological needs as a unifying concept. *Psychological Inquiry*, 11(4), 319–338. doi:10.1207/S15327965PLI1104\_03.
- Ryan, R. M., & Deci, E. L. (2002). An 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: The University of Rochester Press.
- Schaufeli, W. B., Bakker, A. B., & Salanova, M. (2006). The measurement of work engagement with a short questionnaire a cross-national study. *Educational and Psychological Measurement*, 66(4), 701–716. doi:10.1177/0013164405282471.
- Schaufeli, W. B., Leiter, M. P., Maslach, C., & Jackson, S. E. (1996). Maslach Burnout Inventory-General Survey. In C. Maslach, S. E. Jackson, & M. P. Leiter (Eds.), *The Maslach Burnout Inventory—Test manual*. Palo Alto, CA: Consulting Psychologists Press.
- Schaufeli, W. B., Martínez, I. M., Pinto, A. M., Salanova, M., & Bakker, A. B. (2002a). Burnout and engagement in university students a cross-national study. *Journal of Cross-Cultural Psychology*, 33(5), 464–481. doi:10.1177/0022022102033005003.
- Schaufeli, W. B., Salanova, M., González-Romá, V., & Bakker, A. B. (2002b). The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *Journal of Happiness Studies*, 3(1), 71–92. doi:10.1023/A:1015630930326.
- Schriesheim, C. A., Solomon, E., & Kopelman, R. E. (1989). Grouped versus randomized format: An investigation of scale convergent and discriminant validity using LISREL confirmatory factor analysis. *Applied Psychological Measurement*, 13(1), 19–32. doi:10.1177/014662168901300103.
- Self-Determination Theory. (2013). *Basic psychological needs scale*. Retrieved from <http://www.selfdeterminationtheory.org/questionnaires/10-questionnaires/53>.



- Sheldon, K. M., & Filak, V. (2008). Manipulating autonomy, competence, and relatedness support in a game-learning context: New evidence that all three needs matter. *British Journal of Social Psychology*, 47(2), 267–283. doi:10.1348/014466607X238797.
- Sheldon, K. M., & Gunz, A. (2009). Psychological needs as basic motives, not just experiential requirements. *Journal of Personality*, 77(5), 1467–1492. doi:10.1111/j.1467-6494.2009.00589.x.
- 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(4), 439–451. doi:10.1007/s11031-012-9279-4.
- Shevlin, M., & Adamson, G. (2005). Alternative factor models and factorial invariance of the GHQ-12: A large sample analysis using confirmatory factor analysis. *Psychological Assessment*, 17(2), 231–236. doi:10.1037/1040-3590.17.2.231.
- Standage, M., Duda, J. L., & Ntoumanis, N. (2005). A test of self-determination theory in school physical education. *British Journal of Educational Psychology*, 75(3), 411–433. doi:10.1348/000709904X22359.
- Stevens, J. P. (2009). *Applied multivariate statistics for the social sciences*. London: Taylor & Francis.
- Strahan, R., & Gerbasi, K. C. (1972). Short, homogeneous versions of the Marlowe-Crowne Social Desirability Scale. *Journal of Clinical Psychology*, 28(2), 191–193. doi:10.1002/1097-4679(197204)28:2<191:AID-JCLP2270280220>3.0.CO;2-G.
- Tinsley, H. E., & Tinsley, D. J. (1987). Uses of factor analysis in counseling psychology research. *Journal of Counseling Psychology*, 34(4), 414–424. doi:10.1037/0022-0167.34.4.414.
- Van den Broeck, A., Vansteenkiste, M., De Witte, H., Soenens, B., & Lens, W. (2010). Capturing autonomy, competence, and relatedness at work: Construction and initial validation of the Work-related Basic Need Satisfaction scale. *Journal of Occupational and Organizational Psychology*, 83, 981–1002. doi:10.1348/096317909X481382.
- Vander Elst, T., Van den Broeck, A., De Witte, H., & De Cuyper, N. (2012). The mediating role of frustration of psychological needs in the relationship between job insecurity and work-related well-being. *Work & Stress*, 26(3), 252–271. doi:10.1080/02678373.2012.703900.
- Vansteenkiste, M., Lens, W., Soenens, B., & Luyckx, K. (2006). Autonomy and relatedness among Chinese sojourners and applicants: Conflictual or independent predictors of well-being and adjustment? *Motivation and Emotion*, 30(4), 273–282. doi:10.1007/s11031-006-9041-x.
- Vansteenkiste, M., Neyrinck, B., Niemiec, C. P., Soenens, B., De Witte, H., & Van den Broeck, A. (2007). On the relations among work value orientations, psychological need satisfaction, and job outcomes: A self-determination theory approach. *Journal of Occupational and Organizational Psychology*, 80, 251–277. doi:10.1348/096317906X111024.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.