The Basic Psychological Needs at Work Scale: Measurement Invariance between Canada and France

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The purpose of this study is to develop and validate the Basic Psychological Needs at Work Scale (BPNWS) in French, but items are also provided in English in the article. The BPNWS is a work-related self-report instrument designed to measure the degree to which the needs for autonomy, competence, and relatedness, as identified by Self-Determination Theory (Deci & Ryan, 2000), are satisfied at work. Using exploratory and confirmatory factor analysis, the first study examines the structure of the BPNWS in a group of 271 workers. The second study tests the measurement invariance of the scale in a group of 851 teachers from two different cultures, Canada and France. Results support the three-factor structure and show adequate internal consistency, as well as nomological validity across samples.

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INTRODUCTION

The concept of need is one that is fundamental to behavioural science (Latham & Budworth, 2006). Indeed, as early as 1938, Murray had postulated the existence of several social needs, such as the need for relatedness and the need for power. Just a few years later, Maslow (1943) proposed a list of innate needs, hierarchically organised in a pyramid, at the top of which stood the need for self-actualisation. Recently, Sheldon, Elliot, Kim, and Kasser (2001) compared, in three studies, 10 psychological needs (including safety, self-esteem, and popularity) to find which are truly fundamental to human beings. The results support self-determination theory (SDT; Ryan & Deci, 2000) which postulates that the needs for autonomy (to feel free to choose and organise one's life), relatedness (to feel efficient in negotiating life's challenges), and competence (to have positive and beneficial interactions with others) are the most important for human beings. In fact, these needs emerged among the top four needs for both their salience and their association with emotional events in each of their studies. Moreover, Ryan and Brown (2003) show why the need for self-esteem is not a fundamental need for human being and how SDT's needs seem to remain the truly fundamental ones.

To date, autonomy, competence, and relatedness have all been shown to play important roles in areas such as education (Vansteenkiste, Lens, & Deci, 2006), sports (Gagné, Ryan, & Bargmann, 2003; Gillet, Berjot, & Gobancé, 2009) and the workplace (Baard, Deci, & Ryan, 2004), and have also been linked to more individual aspects such as mental health (Ryan & Deci, 2000). Despite the fact that these basic needs have been related to many positive outcomes (e.g. Sheldon & Filak, 2008), including work performance (e.g. Ilardi, Leone, Kasser, & Ryan, 1993) and well-being (e.g. Patrick, Knee, Canevello, & Lonsbary, 2007), only the generic Basic Psychological Needs Scale (Deci & Ryan, 2000) and the more specialised Basic Psychological Needs in Exercise Scale (Vlachopoulos, 2008) have to date been rigorously validated. In work contexts, scales used have not been extensively validated or had some limitations. This article intends to develop and validate the Basic Psychological Needs at Work Scale (BPNWS) using two different methods: the exploratory method and the measurement invariance method.

NEEDS IN SELF-DETERMINATION THEORY

Within SDT, a basic psychological need is described as a universal and innate nutrient for optimal functioning, personal growth and integration, well-being

and social development (Deci & Ryan, 2008). Need satisfaction is also required for intrinsic motivation and internalisation (Gagné & Deci, 2005).

The need for autonomy is defined as an individual's desire to make his or her own choices, to express his or her feelings freely and to initiate his or her own actions (Deci & Ryan, 2002, p. 8; deCharms, 1968). When the need for autonomy is fulfilled, an individual feels free to choose and organise his own actions (Deci & Ryan, 2000, 2002).

The need for competence refers to the individual's desire to have an effect on the environment and to reach desired outcomes (Deci & Ryan, 2000). This need is expressed by an individual's propensity to engage in certain activities that will allow him to utilise his skills and to develop new competencies (Deci & Ryan, 2002, p. 7; Deci, 1975; White, 1959). Thus, one's need for competence is satisfied when one feels skilled enough to carry out a task to the best of one's ability, and thus, reach one's goals (Deci & Ryan, 2000, 2002).

The need for relatedness refers to the desire to establish mutually caring bonds and positive alliances with others (Baumeister & Leary, 1995; Deci & Ryan, 2002, p. 7; Harlow, 1958). It refers to one's need to feel connected to others, to love and to care, as well as to be loved and cared for (Deci & Ryan, 2000, 2002, p. 7).

Need Correlates

Within SDT, need satisfaction is important for well-being. Indeed, several studies have shown a positive relationship between need satisfaction and well-being (Gagné et al., 2003; Reis, Sheldon, Gable, Roscoe, & Ryan, 2000; Uysal, Lin, & Knee, 2010) and a negative relationship between need satisfaction and ill-being (Niemiec, Ryan, & Deci, 2009) in general, as well as between need satisfaction and daily fluctuations of well-being (Ryan, Bernstein, & Brown, 2010; Uysal et al., 2010). Overall, need satisfaction systematically leads to improved psychological well-being within various contexts, including family and friends (Milyavskaya & Koestner, 2011), sports (Reinboth, Duda, & Ntoumanis, 2004), and education (Vallerand, Fortier, & Guay, 1997; Milyavskaya & Koestner, 2011). Need satisfaction's positive effect on psychological well-being extends to individuals undergoing obesity treatment (Vieira et al., 2011), as well as for depressed individuals who are in romantic relationships (Ibarra-Rovillard & Kuiper, 2011).

Organisational research has also shown that need satisfaction is positively linked to well-being (e.g. Kasser & Ryan, 1999), intrinsic motivation (e.g. Ryan & Deci, 2000), and higher performance (e.g. Baard et al., 2004) in the workplace, and is negatively linked to distress at work (e.g. Van den Broeck, Vansteenkiste, De Witte, & Lens, 2008). Lastly, research that has considered autonomy, competence, and relatedness individually has revealed that each of the three needs was positively related to employees' optimal functioning

(Lynch, Plant, & Ryan, 2005) and intrinsic motivation (Gagné, Forest, Gilbert, Aubé, Morin, & Marloni, 2009). These results are in line with the idea that satisfaction of each of the three basic needs contributes to one's personal growth (Ryan, 1995). Furthermore, some organisational and personal variables have also been linked to psychological need satisfaction. For example, procedural justice (van Prooijen, 2009; Grenier, Gilbert, & Savoie, 2010) and optimism (Gilbert, Lebrock, & Savoie, 2008b) were both positively linked to SDT needs.

A Measurement of Basic Psychological Need Satisfaction

In SDT, sufficiently validated measures of basic psychological need satisfaction are commonly used (e.g. Vlachopoulos, 2008); however, to date all work-related measures (Baard et al., 2004; Vansteenkiste et al., 2007) are ad hoc instruments and evidence of their validity has yet to be shown. Moreover, the only validated measure of basic need satisfaction at work has some limitations. First, some of their items do not entirely reflect basic psychological need satisfaction constructs sufficiently well. For example, some might argue that items such as "The tasks I have to do at work are in line with what I really want to do" (Van den Broeck, Vansteenkiste, De Witte, Soenens, & Lens, 2010) is an antecedent (work characteristic) to rather than demonstrative of autonomy satisfaction per se. Also, Van den Broeck et al. (2010) argue that studying need satisfaction and need frustration independently is a promising research avenue and that their scale is designed to measure both. However, tests of the model where need satisfaction is on the same level as need frustration seems to yield a non-ideal fit (i.e. CFI = .77, RMSEA = .18), whereas tests of the model where there are second-order factors of satisfaction versus frustration seem to have a relatively good fit (i.e. CFI = .90, RMSEA = .09). With their scale, it would appear that the best fit (i.e. CFI = .99, RMSEA = .02) is obtained when frustration items are reversed. This is not to say that need frustration cannot be measured; rather, that need satisfaction seems to yield a better statistical fit to the data than separating need satisfaction and need frustration. One hypothesis regarding these results is that need frustration according to Van den Broeck et al. (2010; e.g. "I don't really mix with other people in my job") may only indicate an absence or low level of their items measuring need satisfaction (e.g. "At work, I feel part of a group"). A more accurate measure of need frustration could be the positive statements of the Psychological Need Thwarting Scale (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009; e.g. "I feel I am rejected by those around me") rather than negative statements of need satisfaction. In light of this, one research objective of this study is to develop a parsimonious scale which aims at tapping directly into psychological need satisfaction at work, a

scale that could potentially be combined in further studies with an independent need thwarting scale such as the *Psychological Need Thwarting Scale*.

In this perspective, 13 items that suitably measure the three basic needs in the workplace were chosen. All items were first written in French. The four items measuring the need for autonomy were taken directly from Morin's (2002) scale, the five items measuring the need for competence were all created in line with SDT's definition and inspired by the Basic Need Satisfaction at Work Scale (Leone, 1995, in Baard et al., 2004), and the four items measuring the need for relatedness were taken directly from Richer and Vallerand's (1998) scale.

An English version of the items was then constructed using the translation–back-retranslation procedure, with two translators independently converting the French version into an English one, and two more retranslating the English version into a French one. Table 1 presents items in both languages.[1]

SDT's Basic Psychological Needs Model

Whereas Maslow (1943) proposed hierarchically ordered needs (lower order needs must be satisfied before higher order needs can be fulfilled), SDT hypothesised that all three needs are equally important for individual fulfilment and that all three needs are interrelated (Sheldon et al., 2001). In line with SDT's perspective, the theoretical model that will be tested postulates that the three needs will be correlated. Although the satisfaction of all three needs is important for optimal development, empirical evidence has shown that different needs could be linked to different predictors (Greguras & Diefendorff, 2009), as well as different outcomes (Brien, Boudrias, Lapointe, & Savoie, 2010; Gagné et al., 2009; Greguras & Diefendorff, 2009). Therefore, a three-factor model will be chosen rather than a second-order model.

Measurement Invariance

According to SDT, the basic psychological needs are universal. SDT needs can manifest themselves in different ways across cultures, but regardless of culture, their satisfaction is always essential for optimal functioning (Chirkov & Ryan, 2001; Chirkov, Ryan, & Willness, 2005; Grouzet et al., 2005). Thus, it is imperative to examine whether scores obtained using the *Basic Psychological Needs at Work Scale* (BPNWS) are measurement-invariant across cultures.

STUDY 1

Study 1 will explore and attempt to confirm a three-factor model. The hypotheses tested in Study 1 are as follows: (a) Exploratory factor analysis

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[1] Only the French version of the instrument was validated in this paper.

will group the items into three factors (1) autonomy, (2) competence, (3) relatedness); (b) instrument subscales will emerge as internally consistent (alpha over .70; Kaplan & Saccuzzo, 1993); (c) a three-factor model will provide a good fit with the data in confirmatory factor analysis; and (d) the subscales will be related in theoretically expected ways to predictors (optimism, justice) and outcomes (well-being, distress, intrinsic motivation). Optimism and procedural justice were selected as predictors given that both of them have been frequently positively linked to SDT needs (e.g. justice: van Prooijen, 2009; Gagné & Forest, 2008; e.g. optimism: Gilbert et al., 2008b).

METHOD

Participants and Procedure

Reliability analyses and confirmatory factor analyses were conducted for the first sample. A total of 271 Canadian participants (62% female) were recruited from various occupations using the contacts of students participating in an undergraduate research course. All participants were told that their participation was anonymous and that their responses would remain confidential. They all signed a consent form and completed demographic information. Participants' occupations varied across sectors, including sales (23%), education (14%), health care (9%), manufacturing (7%), financial (6%), and government (6%). To accept participants into the study, there were two inclusion criteria: participants were required to be at least 18 years old (legal age in Canada) and must have occupied their current post for at least three months. If they didn't meet these criteria, they were not eligible to respond. Age was measured in ranges (e.g. 21–30, 31–40). Accordingly, in this sample, 49 per cent of participants were less than 30 years old and 32 per cent were more than 41 years old. The majority of participants were permanent workers (73%) and worked between 21 and 60 hours per week (78%). Finally, 60 per cent of participants had been employed in their organisation for less than 5 years and 27 per cent had been employed for more than 10 years.

Measures

Intrinsic Need Satisfaction. Work need satisfaction was measured with the 13-item *Basic Psychological Needs at Work Scale* (BPNWS) measuring needs for autonomy (e.g. my work allows me to make decisions), competence (e.g. I feel competent at work) and relatedness (e.g. When I'm with the people from my work environment, I feel understood) using a 6-point Likert-type scale, ranging from 1 (Strongly disagree) to 6 (Strongly agree). Internal reliability was good, with alphas between .86 (autonomy) and .89 (competence).

Intrinsic Motivation.   We measured intrinsic motivation with the three-item scale of the Motivation at Work Scale (e.g. Because I enjoy this work very much; Gagné et al., 2009; α = .93).

Well-Being.   The questionnaire used in this study was an adaptation of the Well-Being Manifestations Measure Scale (Massé et al., 1998; e.g. In the last month, my morale was good) to the work setting (Gilbert et al., 2008b). This is a 25-item instrument on a 5-point scale, from 1 (Almost never) to 5 (Almost always). In the present data set, alpha was .93 for the total score. Construct validity of this measure was demonstrated by Gilbert et al. (Gilbert, Lebrock, & Savoie, 2008a, 2008b; Gilbert, 2009).

Distress.   We measured distress at work with the 23-item work setting adaptation (Gilbert et al., 2008b) of the Distress Manifestations Measure Scale (Massé et al., 1998; e.g. I felt useless). Several studies, including those having employed confirmatory factor analysis, support the validity and reliability of this measure (Gilbert et al., 2008a, 2008b; Gilbert, 2009). In the present data set, alpha was .95.

Optimism.   A French-Canadian version (Trottier, Mageau, Trudel, & Halliwell, 2008) of the six-item Life Orientation Test-Revised (LOT-R; e.g. I'm always optimistic about my future; Scheier, Carver, & Bridges, 1994) was used in this study. Alpha was .72.

Procedural Justice.   Procedural justice were measured with the seven-item Moorman's scale (1991; e.g. procedures designed to collect accurate information necessary for making decisions) using a Likert scale ranging from 1 (Completely disagree) to 6 (Completely agree). Alpha was .86.

RESULTS

Data Screening

Sample 1 data were examined to verify whether they met the assumptions for multivariate analysis. All measures were normally distributed, with kurtosis and skewness values within the +1 to −1 range (Muthén & Kaplan, 1985). Also, there was no evidence of singularity or multicollinearity. Table 2 presents means and *SD*s for each variable.

Exploratory Factor Analysis and Factor Reliability

The factorial structure of the BPNWS was tested using exploratory factor analysis (EFA). Analyses included maximum likelihood (ML) estimation and

promax rotation with SPSS 16.0. Although it is recommended that confirmatory factor analysis (CFA) be used to test the factorial structure of a scale, EFA are sometimes performed on a measure prior to CFA. This is a justified strategy in the earlier stage of scale development (Babyak, Snyder, & Yoshinobu, 1993; Byrne, 1994; Pentz & Chou, 1994). The EFAs yielded three eigenvalues over one and the screeplots also indicated a three-factor solution. One item from the competence subscale had a low loading (.30) on its factor as well as a low cross-loading (.30) on the autonomy subscale, and was subsequently eliminated. This elimination brought the BPNWS down to four items per factor (12 items instead of 13). The alpha coefficients were between .86 (autonomy) and .89 (competence). The complete results are reported in Table 1.

Confirmatory Factor Analysis and Scale Reliability

A confirmatory factor analysis was performed on sample 1 using EQS 6.1 (Bentler, 2006). Given that the BPNWS was created a priori to assess three underlying factors, a hypothesised three-factor structure was tested. These factors corresponded to the three subscales (autonomy, competence, and relatedness) and were made up of the four corresponding items for each subscale. No cross-loadings were postulated; however, a covariance between the three intrinsic needs latent factor was hypothesised in accordance with SDT postulates and EFA suggestions.

To assess the fit of the models, goodness-of-fit indices were used in combination with the χ^2 statistic (taking into account that the chi-square statistic is highly sensitive to sample size; Hu & Bentler, 1995). Fit indices were the CFI, the RMSEA, the RMSEA 90 per cent confidence interval, the SRMR, and the NFI. CFI and NFI values greater than .90 indicate a good fit of the model to the data (Hu & Bentler, 1995), whereas values of .95 or greater indicate an excellent fit (Hu & Bentler, 1999). Hu and Bentler (1999) also indicated that values lower than .08 for the SRMR indicate good model fit. RMSEA values smaller than .08 indicate good fit of the model to the data, and values lower than .05 indicate very close fit (McCallum, Browne, & Sugawara, 1996). RMSEA 90 per cent confidence interval (CI) was also used to assess hypotheses of very close fit (RMSEA < .05) and not a close fit (RMSEA > .10; McCallum et al., 1996).

The CFA supported the factor structure of the BPNWS (χ^2 (51) = 135.49, $p < .001$, CFI = .956, RMSEA = .079 and 90 per cent CI = .063, .095, SRMR = .06, NFI = .931).

Nomological Validity

Correlations with constructs that were positively or negatively correlated with basic need satisfaction in SDT are presented in Table 2. In line with

TABLE 1
Factor Loadings, Communalities (h²), Factor Correlations, Cronbach's Alpha, and Percent of Variance and Covariance for ML Extraction and Promax Rotation

Item		*Factor loading*			
		1	*2*	*3*	*h²*
1	Mon travail me permet de prendre des décisions	−.06	−.05	.83	.62
	My work allows me to make decisions				
2	Je peux exercer mon jugement pour résoudre des problèmes dans mon travail	−.09	.05	.86	.73
	I can use my judgement when solving work-related problems				
3	Je peux assumer des responsabilités dans mon travail	.07	−.02	.80	.67
	I can take on responsibilities at my job				
4	Au travail. je me sens libre d'exécuter mes tâches à ma façon	.21	.00	.60	.51
	At my work, I feel free to execute my tasks in my own way				
5	J'ai les capacités pour bien faire mon travail	.02	.85	−.06	.69
	I have the ability to do my work well				
6	Je me sens compétent à mon travail	.04	.88	−.02	.79
	I feel competent at work				
7	Je suis capable de résoudre des problèmes à mon travail	−.07	.70	.21	.63
	I am able to solve problems at work				
8	Je réussis bien dans mon travail	.02	.84	−.08	.66
	I succeed in my work				
9	Avec les personnes qui m'entourent dans mon milieu de travail, je me sens compris	.92	.00	−.06	.81
	When I'm with the people from my work environment, I feel understood				
10	Avec les personnes qui m'entourent dans mon milieu de travail, je me sens écouté	.91	−.10	.02	.78
	When I'm with the people from my work environment, I feel heard				
11	Avec les personnes qui m'entourent dans mon milieu de travail, je me sens en confiance avec eux	.74	.08	.06	.64
	When I'm with the people from my work environment, I feel as though I can trust them				
12	Avec les personnes qui m'entourent dans mon milieu de travail, je me sens un ami pour eux	.62	.08	.01	.43
	When I'm with the people from my work environment, I feel I am a friend to them				
Factor correlations					
Factor 1—Autonomy		—			
Factor 2—Competence		.40	—		
Factor 3—Relatedness		.41	.47	—	
Alpha coefficient		.86	.89	.88	
Percent of variance by PCA (Principal component analysis)		44.4	16.0	14.1	
Percent of variance by EFA (ML and Promax)		41.4	13.5	11.5	
Percent of covariance		22.3	22.6	20.9	

Factor Loadings > .30 are in dark.

TABLE 2
Nomological Validity of the BPNWS (Correlations)

	Mean	SD	Need for autonomy	Need for competence	Need for relatedness
Need for autonomy	3.12	.63			
Need for competence	3.52	.48	.43***		
Need for relatedness	3.15	.60	.40***	.38***	
Optimism	2.93	.42	.28***	.39***	.33***
Intrinsic motivation	2.99	.80	.53***	.33***	.41***
Distress	1.67	.55	−.36***	−.33***	−.48***
Well-being	3.91	.55	.47***	.46***	.45***
Procedural justice	2.84	.57	.43***	.40***	.52***

Note: N ranges from 261 to 271.
*** $p < .001$.

SDT, all three basic needs seem to promote psychological health by being positively correlated to well-being ($.45 < r < .47$, $p < .001$) and negatively correlated to distress ($-.33 < r < -.48$, $p < .001$). Also, intrinsic motivation was related to satisfaction of the needs for autonomy ($r = .53$, $p < .001$), competence ($r = .33$, $p < .001$), and relatedness ($r = .41$, $p < .001$). In line with Gilbert et al. (2008b), optimism, an individual resource, and procedural justice, an organisational resource, are positively related to autonomy ($r = .28$ and $r = .43$, $p < .001$), competence ($r = .39$ and $r = .40$, $p < .001$), and relatedness ($r = .33$ and $r = .52$, $p < .001$) need satisfaction.

STUDY 2

In agreement with Messick (1995), who argued that construct validation is an iterative process that requires several sources and samples, Study 2 examines the invariance property of the scale and assumes that BPNWS item responses are invariant across cultures (in this case, Canada and France). Evidence of invariance would support the generalisability and validity (Messick, 1995) of BPNWS scores across different cultures. The hypotheses tested in Study 2 are as follows: (a) the BPNWS instrument will be configurally invariant, implying that in both groups, the data are broken down into the same number of factors (same pattern of item loadings; Cheung & Rensvold, 2002); (b) the metric invariance of BPNWS scores is supported, implying that the stretch of the relationship between each item and its associated factor is invariant across groups; (c) the structural invariance of BPNWS is supported, implying that the strength of the relationship between each item and its associated factor and between each of the three factors will be equivalent across groups;

(d) instrument subscales will emerge as internally consistent (alpha over .70; Kaplan & Saccuzzo, 1993); and (e) the subscales will be related in theoretically expected ways with predictors and outcomes.

METHOD

Participants and Procedure

All participants from the two samples were told that their participation was anonymous and that their responses would remain confidential. All participants signed a consent form and completed demographic information.

Sample 1 (Canada).   School boards were invited to take part in a study where the psychological health of their primary and secondary school teachers would be assessed. Thereafter, school boards proposed to their school principals that they participate in the project. If a school principal was interested in taking part in the study, an appointment was scheduled with the researchers on a forthcoming pedagogical day. At that scheduled time, researchers presented the study to the teachers and had them sign a consent form before the questionnaires were distributed and completed. Participants were 488 teachers (69% female) from elementary schools (42%), high schools (54%), and vocational training schools (4%). Age was measured in ranges (e.g. 21–30, 31–40). Accordingly, in this sample, the majority of the participants were between the ages of 31 and 50 years (63.5%, with 19% under 30 and 17.5% over 50), were highly educated (79.5% had a bachelor's degree and 15.1% had a master's degree or more) and held a full-time position (94.6%). Participants had an average of 13.6 years ($SD = 9.0$ years) of experience as teachers.

Sample 2 (France).   Research assistants recruited teachers from schools located in northern France to participate in a questionnaire study. Teachers were given an explanation on the details of the study, such as the purpose of the study (e.g. investigating the quality of teachers' work life) and the time required to complete the questionnaire (e.g. 45 minutes), and their consent to participate was obtained. Participants were given two weeks to complete the questionnaire during their own time and return it to the research assistants. Participants were also informed that all their responses would be kept confidential and anonymous. Participants were 363 teachers (60% female) recruited from elementary schools (34%) and high schools (32% *collège* and 29% *lycée*). Participants had a mean age of 40.6 years ($SD = 10.6$ years) and had been employed as teachers for an average of 16.8 years ($SD = 11.1$).

Measures

All questionnaires were the same as in Study 1. As report in Tables 4 and 5, all Cronbach's alpha coefficients were good for both samples (the lowest alpha was for optimism with an alpha coefficient of .77 for the Canadian sample and .79 for the French sample).

RESULTS

Data Screening

The two samples' data sets were examined to verify that they met the assumptions for multivariate analysis. Both data sets were normally distributed, with kurtosis and skewness values within the +1 to −1 range (Muthén & Kaplan, 1985). Also, there were no missing values, nor was there evidence of singularity or multicollinearity.

Based on the assumption that all three needs are universal and that individual, contextual, and cultural factors can foster levels of need satisfaction (Gagné & Deci, 2005; Deci & Ryan, 2008), t-tests were conducted to compare the three need satisfaction mean scores across cultural groups. No statistically significant difference in strength for relatedness ($t(849) = 1.63$, $p = .10$) was found between Canada ($M = 4.62$, $SD = .88$) and France ($M = 4.52$, $SD = .88$). A significant difference was found between France ($M = 4.99$, $SD = .65$) and Canada ($M = 4.23$, $SD = .56$) in mean scores for competence satisfaction ($t(849) = 5.81$, $p < .001$). Satisfaction of the need for autonomy was also different ($t(684,36) = 4.45$, $p <.001$) across Canada ($M = 4.96$, $SD = .65$) and France ($M = 4.73$, $SD = .79$). These results are in line with Väänänen et al. (2005), who demonstrated autonomy differences between France and Canada in terms of their respective cultures. Indeed, the mean differences found between Canada and France could be partially attributed to differences between these countries on cultural dimensions such as individualism and power distance (Hofstede, 1983). Finally, means higher than 4 (Slightly agree) on the BPNWS suggest the presence of all three needs in both cultures.

Factorial Structure

The factorial structure of the BPNWS was assessed through CFA. For each of the two samples (Canada and France), the initial model corresponded to the one tested in the first study, that is, three correlated factors made up of the four corresponding items for each subscale. No cross loadings were hypothesised. The fit of this initial model was good (within an acceptable range) for

both Canada and France (see Table 3). This model was chosen as the baseline model for invariance analyses (Byrne, 2006).

Invariance Analysis

The factorial invariance of the BPNWS was tested using the procedure outlined in Byrne (2006). First, the baseline model was tested (step 1) by combining the two samples to show the configural invariance (same pattern of item loadings). This model's fit with the data was acceptable (see Table 3). The second and third steps are the verification of the metric invariance (pattern coefficients) and the measurement invariance (correlations between latent factors) across groups (Byrne, 2006). By constraining the pattern coefficients to be equal across the two samples (step 2), the model still fit the data well with no significant deterioration in model fit (see Table 3). A statistically significant deterioration in fit would imply a ΔCFI larger than −.01 (Cheung & Rensvold, 2002). The third step, the structural model invariance, involves constraining correlations between the latent factors as well as all pattern coefficients to be equal across groups. The $\Delta\chi^2$ indicates a significant deterioration in model fit when compared to the previous model (see Table 3); however, ΔCFI indicates a negligible deterioration.

When a model doesn't pass all invariance tests, Byrne (2006) suggests testing partial-measurement invariance where only specific parts of the model are verified. By this logic, she suggests identifying correlations between latent factors that are not invariant across groups. Investigation of model misspecification with the maximum likelihood Lagrange Multiplier (LM) test for releasing constraints revealed that one constraint did not behave the same way in the two samples (i.e. autonomy with competence). Releasing this constraint identified the only constraint that significantly improved the models, which was an enhancement in chi-square that was five times larger than the one for the next suggested constraint release. Table 4 shows the difference in the autonomy–competence correlation between both groups. It reveals that while the latent correlation between autonomy and competence needs was .37 in Canada, it was .60 in France. Although both of these correlations are still considered moderate to high, and concur with what is postulated in the theory, they still differ in magnitude. By releasing this constraint, the overall fit was better and closer to the generally recognised boundary (see Table 3). Support for a second-order model was finally found using the overall sample, where needs for autonomy, competence, and relatedness load on a second-order latent factor labelled intrinsic needs (see Table 3). However, because each of the SDT needs could be predicted with different independent variables (Greguras & Diefendorff, 2009) and because the improvement in fit over the previous fully constrained model was greater than the recommended cut-off (see Table 3), the three correlated factors

TABLE 3
Fit Statistics for Alternative Models

Models	N	S-Bχ²	df	χ²/df	RMSEA	90% CI	CFI	SRMR	AIC	AGFI	Model comparison	Δχ²	ΔCFI
Canada only	488	197.59***	51	3.87	.08	.07–09	.944	.05	95.59	.89			
France only	363	172.86***	51	3.39	.08	.07–09	.945	.05	70.86	.92			
Baseline model—(Configural invariance—Two countries combined)	851	370.77***	102	3.64	.08	.07–09	.944	.05	166.77	.88			
Metric invariance (same strengths of item loadings: pattern coefficients were constrained)	851	384.23***	111	3.46	.08	.07–08	.943	.05	162.23	.89	Baseline vs. Measurement	15.41	–.001
Structural invariance 1 (same strengths of item loadings and same strengths of factor covariances: pattern coefficients and latent factor covariances were constrained)	851	409.71***	114	3.59	.08	.07–09	.939	.06	181.71	.89	Measurement vs. Structural	29.70***	–.004
Structural invariance 2 (pattern coefficients and latent factor covariances were constrained exept covariance between autonomy and competence)	851	385.24***	113	3.41	.08	.07–08	.944	.04	159.24	.89	Structural vs. Structural –1	–27.78***	.005
Second order baseline model	851	257.30***	94	2.74	.06	.06–07	.966	.05	69.31	.87			
Single factor baseline model	851	2739.38***	111	24.68	.24	.23–25	.456	.20	4703.22	.33			

Note: The change in chi-square test was conducted using the standard chi-square values, as the S-B chi-square does not have the same type of distribution.
*** $p < .001$.

TABLE 4
Correlations between the Latent Variables Representing the BPNWS Subscales,
Alpha Coefficients, and 95 per cent Confidence Intervals

| | *Autonomy* | *Competence* | *Relatedness* | *Alpha coefficients (95% CI)* | |
				Canada	*France*
Autonomy		.60***	.41***	.84 (.82–.86)	.85 (.82–.87)
Competence	.37***		.22***	.88 (.86–.90)	.90 (.89–.92)
Relatedness	.41***	.28***		.90 (.89–.92)	.88 (.86–.90)

Note: $N = 851$. Correlations for Canada are below the diagonal and France above. They were taken from the CFAs conducted on each sample separately.
*** $p < .001$.

model was retained as the final model. Ultimately, the fit for this model appears suitable to justify the use of a global score in some studies.

Reliabilities

Alpha coefficients for the BPNWS subscales are provided in Table 4. All of the six alpha coefficients (for each of the three subscales in two languages) are above the generally recognised standards (.70; Kaplan & Saccuzzo, 1993), and ranged from .84 (autonomy in Canada) to .90 (relatedness in Canada and competence in France).

Nomological Validity

Correlations with hypothesised antecedents and outcomes are presented in Table 5. All three basic psychological needs were negatively related to distress ($-.28 < r < -.42$, $p < .001$) and positively related to well-being ($.37 < r < .56$, $p < .001$), intrinsic motivation ($.26 < r < .38$, $p < .001$), optimism ($.19 < r < .39$, $p < .001$), and procedural justice ($.14 < r < .49$, $p < .001$).

DISCUSSION

Items for the Basic Psychological Needs at Work Scale (BPNWS) were developed and its factorial structure and validity were tested using an exploratory and confirmatory method (Study 1) followed by an invariance analysis between two countries, Canada and France (Study 2). Results across samples provided good support for the psychometric properties of the BPNWS. The final model comprising three correlated factors is consistent with SDT theory. Moreover, all three basic needs were related to other relevant

TABLE 5
Nomological Validity of the BPNWS (Correlations)

	Mean	SD	*Cronbach's alpha*	*Need for autonomy*	*Need for competence*	*Need for relatedness*
Optimism						
(Canada)	4.73	.73	.77	.37***	.39***	.30***
(France)	4.21	.89	.79	.30***	.35***	.19***
Intrinsic motivation						
(Canada)	4.83	.93	.90	.32***	.38***	.31***
(France)	4.59	1.01	.82	.37***	.31***	.26***
Distress						
(Canada)	1.71	.59	.95	−.33***	−.40***	−.42***
(France)	1.67	.61	.91	−.30***	−.28***	−.31***
Well-being						
(Canada)	4.00	.49	.93	.42***	.56***	.42***
(France)	3.83	.25	.86	.45***	.46***	.37***
Procedural justice						
(Canada)	4.01	.91	.91	.43***	.23***	.36***
(France)	3.97	1.05	.92	.32***	.14***	.49***

Note: *N* ranges from 475 to 488 for the Canada sample and was 363 for France. Mean, *SD*, Cronbach's alpha and bivariate correlations were obtained using SPSS 16.0.
*** $p < .001$.

constructs pertaining to organisational behaviour. Indeed, as studies have previously suggested, the three basic needs are positively related to well-being (Sheldon & Niemiec, 2006), procedural justice (Grenier et al., 2010), optimism (Gilbert et al., 2008b), and intrinsic motivation (Gagné et al., 2009), and negatively related to distress (Gilbert et al., 2008a).

Limitations and Suggestions for Further Research

Although results for the BPNWS are promising, there are some limitations to the present research. First, cross-sectional correlations and self-reported data could lead to common method variance issues. Further validation of this scale should examine relations with different measures (e.g. objective performance measures) and test causal relationships with antecedents (e.g. justice) and outcomes (e.g. well-being) using an experimental design. Second, the present study used a convenience sample of Canadian workers for the first study and two convenience samples of teachers for invariance analysis of Study 2. Further work will need to validate the BPNWS scores in other cultures and languages (particularly for the English version already available) as well as in other types of job and organisation. Finally, future studies could examine the relative contribution of each of the three needs in the prediction

of diverse outcomes. The BPNWS offers a reliable and valid tool to further explore these assumptions and research questions.

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