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Running Head. Need Satisfaction

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Abstract

The present research assessed the underlying psychometric multidimensionality and nomological validity of 523 employees' response to the Work-related Basic Need Satisfaction (W-BNS) scale using bifactor-exploratory structural equation modeling (bifactor-ESEM). Our results first showed the superiority of a bifactor-ESEM representation when compared to alternative representations of the data. Thus, employees' ratings of psychological need satisfaction simultaneously reflected a global need satisfaction construct, which co-existed with specific autonomy, competence, and relatedness needs satisfaction. Importantly, our findings also supported the nomological validity of employees' ratings of psychological need satisfaction in relation to measures of positive affect, negative affect, job satisfaction, perceived organizational support, organizational citizenship behaviors, work engagement, and burnout. In addition, our results also supported the presence of indirect (mediated) effects between perceived organizational support and some of the outcome variables as mediated by employees' levels of need satisfaction.

Key words: Psychological need satisfaction; Bifactor; Exploratory structural equation modeling; Perceived organizational support

Self-determination theory (SDT; Ryan & Deci, 2017) proposes that the satisfaction of the needs for autonomy (the need to experience a sense of volition and psychological freedom), competence (the need to feel effective when interacting with one's environment), and relatedness (the need to feel connected with others) is associated with positive outcomes across all life domains, including work (Gagné & Deci, 2005). Supporting this proposition, research has shown that the satisfaction of these three needs at work was conducive to motivation, positive functioning, and well-being among employees. Need satisfaction is thus a mechanism through which organizations can exert a positive impact on employees (for a recent review, see Ryan & Deci, 2017). Importantly, these three needs are generally assumed to be relatively independent from one another, and yet assumed to yield complementary desirable effects (Ryan & Deci, 2017). However, research shows that the degree of satisfaction of these three needs tends to be moderately inter-correlated (Knight, Patterson, Dawson, & Brown, 2017), thus calling into questions their relative independence.

This realization led Sheldon and Niemiec (2006) to propose that the benefits of need satisfaction should be greater when the satisfaction of all three psychological needs are in alignment (i.e., when all three needs are similarly fulfilled) rather than in the presence of imbalance in the degree of satisfaction of all three needs (i.e., when the extent to which each specific need is met differs across all three needs). These authors found support for this proposition in the prediction of intrinsic motivation among undergraduate university students. Dysvik, Kuvaas, and Gagné (2013) reported similar results in the prediction of workers' intrinsic motivation. However, they noted that the measure of need (im)balance did not account for any additional variance in intrinsic motivation once the main effects of each three needs and of their interactions were taken into account. When considering these results, it is important to note that both studies relied on an indirect measurement of the degree of alignment in the satisfaction of all three needs via the calculation of difference scores, known to be particularly sensitive to measurement errors (Edwards, 2002). An additional flaw of the approach taken by Dysvik et al. (2013) comes from their addition of these difference scores to a complex regression equation already incorporating interaction effects among all three needs. Indeed, the alignment effects captured in these difference scores are mathematically redundant with the interaction effects already incorporated in the equation (e.g., Edwards, 2009). This statistical redundancy could explain Dysvik et al.'s (2013) observation of the limited added-value of these difference scores.

Recent research on the structure of need satisfaction suggests that a more direct measure of the degree of alignment in the satisfaction of all three needs is possible. Indeed, recent psychometric research has revealed need satisfaction ratings could be represented in a way that made it possible to simultaneously consider two complementary components (Sánchez-Oliva et al., 2017; Tóth-Király, Morin, Bőthe, Orosz, & Rigó, 2018). The first of those component reflects respondents' global levels of need satisfaction across all three needs. In contrast, the second component reflects the more specific levels of satisfaction of respondents' needs for competence, relatedness, and autonomy left unexplained by this global level of need satisfaction. In this second component, participants' specific levels of need satisfaction are directly expressed as deviations from the global level of need satisfaction expressed in the first component. As such, this second component provides a direct representation of the extent to which the satisfaction of each specific need can be considered to be in a state of imbalance relative to the satisfaction of all other needs.

Importantly, research in which these two layers of measurement cannot be properly disentangled carries the risk of leading to an overly similar assessment of the relative contribution of each psychological need, reflecting mainly the effect of the first component (Morin, Boudrias et al., 2016, 2017). In such cases, it is thus impossible to clearly identify the unique contribution of each need over and above that of global levels of need satisfaction (Sánchez-Oliva et al., 2017; Tóth-Király et al., 2018). Despite the interest of the improved psychometric representation proposed in these studies, the criterion-related validity of the resulting global and specific (i.e., imbalance) need satisfaction components remains insufficiently explored. This limitation is important as criterion-related validity is critical to our ability to ascribe any specific meaning to latent constructs. The present research seeks to address this limitation by investigating how these global and specific levels of need satisfaction relate to perceived organizational support and key work outcome variables.

Psychological Need Satisfaction at Work: Psychometric Considerations

The previous discussion suggests that need satisfaction ratings would be better represented by

multidimensional measurement models providing a way to simultaneously reflect their global and specific nature. Psychometric multidimensionality refers to the observation that specific item ratings may sometimes come to reflect more than one latent construct (Morin, Arens, & Marsh, 2016; Morin, Boudrias et al., 2016, 2017). Morin, Arens, and Marsh (2016) note the importance of distinguishing among two different forms of psychometric multidimensionality. The first refers to the assessment of coexisting global (G-factor: global levels of need satisfaction) and specific (S-factors: unique levels of satisfaction of each need, need imbalance) latent constructs. The second refers to the presence of reliable associations between items and more than one factor (i.e., cross-loadings; Morin, Arens, & Marsh, 2016). For instance, levels of autonomy need satisfaction may influence responses to items designed to assess competence or relatedness needs satisfaction. In this example, these cross-loadings could occur in part because of the naturally imperfect nature of these ratings, but also because autonomy, competence, and relatedness needs satisfaction are conceptually interrelated (Trépanier, Fernet, & Austin, 2013). These two forms of psychometric multidimensionality are ignored in classical confirmatory factor analyses (CFA), in which items are typically forced to reflect a single latent factor (e.g., Morin, Marsh, & Nagengast, 2013). Indeed, bifactor models are required to simultaneously assess global (G-factors) and specific (S-factors), whereas exploratory factor analyses are required to estimate cross-loadings between items and conceptually-related constructs. Importantly, ignoring psychometric multidimensionality, when present in items ratings, has been shown to lead to biased estimates of factor correlations (e.g., Asparouhov, Muthén, & Morin, 2015) and of associations with external criterion-variables (Mai, Zhang, & Wen, 2018).

Practical Implications of Psychometric Multidimensionality for Theory and Research

In practical terms, failure to consider the possibility that need satisfaction ratings may simultaneously tap into two types of latent constructs (G- and S-factors) is likely to erroneously lead to the conclusion that the needs for autonomy, competence, and relatedness simply reflect relatively independent constructs with comparable effects. Indeed, these comparable effects would mainly reflect the underlying effects of participants' global levels of need satisfaction, and serve to hide the possible complementary effects of need imbalance. The practical implications of ignoring cross-loadings are not as easy to understand. On the one hand, it is relatively easy to grasp why some specific item ratings might present small cross-loadings on secondary factors. On the other hand, it might seem more logical, and parsimonious, to simply ignore these secondary associations. Yet, statistical research (for a review, see Asparouhov et al., 2015) has shown that excluding even negligible cross-loadings (i.e., as small as .100) tends to result in inflated estimates of the G-factor in a bifactor model (i.e., will make it harder to identify need imbalance) or of factor correlations in CFA. In contrast, it has also been shown that including unnecessary cross-loadings will not result in estimation biases. These observations thus suggest that it is the exclusion of these cross-loadings that is likely to result in a biased picture of the way constructs related with one another (Asparouhov et al., 2015) and with other constructs (Mai et al., 2018).

In sum, ignoring these forms of multidimensionality is likely to lead to a biased view of the validity of the constructs under consideration and the reality under study. For applied researchers interested in need satisfaction, this means that the ability to obtain a clear, and valid, estimate of the way need satisfaction ratings related to other constructs of interest is likely to be biased, and more importantly to lead to biased recommendations for practice. For example, as discussed above, research relying on a CFA representation is likely to lead to the conclusion of comparable effects associated with all three needs. In contrast, a more accurate representation might possibly reveal deleterious effects associated with imbalance in the satisfaction of one specific need that would be impossible to detect using CFA.

A Bifactor-ESEM Representation of Psychological Need Satisfaction at Work

The new bifactor exploratory structural equation modeling (ESEM) framework (Morin, Arens, & Marsh, 2016) provides a way to systematically account for the two types of multidimensionality in a single model. It thus appears to be particularly well-suited to investigations of the dimensionality of psychological need satisfaction at work. ESEM and bifactor models have been recently used in organizational research to examine the structure of employees' personality (McAbee, Oswald, & Connelly, 2014), well-being (Morin, Boudrias et al., 2016, 2017), need satisfaction (Sánchez-Oliva et al., 2017), motivation (Howard, Gagné, Morin, & Forest, 2018), and affective commitment (Perreira et al., 2018).

When considering need satisfaction, emerging research also supports the value of a bifactor-CFA approach in the educational (Gillet, Morin et al., 2018) and work (Bidee, Vantilborgh, Pepermans, Griep, & Hofmans, 2016) areas. Fewer studies have considered the bifactor-ESEM framework. Yet, Tóth-Király et al.'s (2018) results supported a bifactor-ESEM approach in a series of two studies focusing on global (rather than domain-specific) need fulfillment (combining need satisfaction and frustration). In the work context, a single study (Sánchez-Oliva et al., 2017) has tested, and supported, the superiority of a bifactor-ESEM representation of ratings on the Basic Psychological Needs at Work Scale (BPNWS; Brien et al., 2012). Despite their interest, these results have never been replicated. A first objective of the present research is thus to replicate these results using the Work-related Basic Need Satisfaction (W-BNS; Van den Broeck, Vansteenkiste, De Witte, Soenens, & Lens, 2010) scale. The W-BNS is, arguably, the most widely used questionnaire for the assessment of employees' need satisfaction at work (Knight et al., 2017).

Establishing the Nomological Network of Global and Specific Need Satisfaction at Work

A more important limitation of Sánchez-Oliva et al.'s (2017) study lies in their restricted investigation of the nomological network of global and specific (imbalance) components of need satisfaction. Their findings revealed that global levels of need satisfaction were negatively related to all burnout components (emotional exhaustion, depersonalization, and professional efficacy). In addition, they showed that specific levels of imbalance in the satisfaction of the need for competence were negatively related to depersonalization, and positively related to professional efficacy. In contrast, imbalance in relatedness need satisfaction was negatively related to emotional exhaustion. No effects were found in relation to imbalance in autonomy need satisfaction.

To consider broader tests of criterion-related validity, our second objective was to assess the extent to which employees' global and specific levels of need satisfaction were related to a more diversified set of outcomes (i.e., positive and negative affect, job satisfaction, organizational citizenship behaviors, and work engagement). These outcomes were retained based on evidence of their associations with need satisfaction ratings (Huyghebaert et al., 2018; Trépanier et al., 2013, 2016). Prior research leads us to expect that global levels of need satisfaction will be negatively related to negative affect and burnout, and positively related to positive affect, job satisfaction, organizational citizenship behaviors, and work engagement (Gillet, Fouquereau, Forest, Brunault, & Colombat, 2012; Huyghebaert et al., 2018). These expectations are also aligned with SDT, according to which autonomy, competence, and relatedness needs satisfaction are defined as essential nutrients for human functioning and well-being (Gagné & Deci, 2005; Ryan & Deci, 2017). We also hypothesized that, over and above these global levels of need satisfaction at work, specific levels of imbalance in the satisfaction of the needs for autonomy, competence, and relatedness will also present direct relations with the outcomes (Sánchez-Oliva et al., 2017).

Identifying Work-Related Determinants of Global and Specific Need Satisfaction

To understand need satisfaction, it is also important to consider the need supportive or thwarting impact of work characteristics (Gagné & Deci, 2005). For instance, Gillet et al. (2012) showed that perceptions of supervisors' autonomy-supportive behaviors were positively related to need satisfaction at work. In contrast, perceptions of their controlling behaviors were associated with lower levels of need satisfaction. In the present study, our third objective is to extend this research by considering the role of employees' perceptions of organizational support (i.e., the extent to which their organization cares about their well-being and values their contributions; Eisenberger, Huntington, Hutchison, & Sowa, 1986) in the prediction of their global and specific need satisfaction.

The effects of perceived organizational support have been examined in relation to multiple outcomes such as organizational commitment, job satisfaction, and performance. Employees perceiving high levels of organizational support are likely to consider favorable actions from their organization as an indication that the organization is committed toward them (Eisenberger & Stinglhamber, 2011). In turn, these perceptions should generate a felt obligation to reciprocate by helping the organization to attain its objectives through favorable work attitudes and behaviors (Eisenberger et al., 1986). Organizational support theory also suggests that perceived organizational support helps to fulfill employees' socioemotional needs. Gillet et al. (2012) showed that perceived organizational support positively predicted employee need satisfaction. Unfortunately, they did not consider the relative impact of perceived organizational support on the specific needs for autonomy, competence, and relatedness. To our knowledge, no research has examined the effects of perceived

organizational support on global and specific (imbalance) levels of need satisfaction. However, prior studies (e.g., Gillet et al., 2012) suggest that perceptions of organizational support should be positively related to employees' global levels of need satisfaction.

As such, the relations considered in the present study form a mediation chain according to which perceived organizational support predicts need satisfaction, which in turn predicts outcomes. Although past studies have shown that the effects of organizational factors (e.g., perceived organizational support, perceived autonomy support) on outcomes were mediated by need satisfaction, they disagreed regarding whether this mediation was partial or complete (Gillet et al., 2012; Huyghebaert et al., 2018). Thus, although we hypothesize mediation, we leave as an open question whether this mediation will be partial or complete.

Method

Participants and Procedures

Paper questionnaires were distributed by research assistants to a convenience sample of 523 workers (241 men; 282 women) from various organizations (e.g., public hospitals, industries, sales, and services) located in France. Participants received a survey packet including the questionnaire, a cover letter explaining the objectives of the study, and a consent form stressing that participation was anonymous and voluntary. Questionnaires required approximately 20 minutes to complete, after which they were returned to the research assistants. All questionnaires were administered in French and instruments not already available in this language were adapted using a standardized back-translation procedure (van de Vijver & Hambleton, 1996). French and English versions of all items used in the present research are provided in Appendix 1 of the online supplements. Respondents were aged between 18 and 64 years (M = 35.79, SD = 11.16), had an average organizational tenure of 8.27 years (SD = 8.66), and an average tenure in the current position of 5.40 years (SD = 6.24). In addition: (a) 86.8% of the participants worked full-time and 81.5% were permanent workers; and (b) 2.7% of the participants had no diploma, 21.2% completed vocational training, 21.4% completed high school, and 54.7% completed university.

Measures

Work-related need satisfaction. Need satisfaction at work was assessed with the W-BNS scale (Van den Broeck et al., 2010). Four items assessed competence need satisfaction (α = .71; e.g., "I really master my tasks at my job"), six items autonomy need satisfaction (α = .78; e.g., "I feel like I can be myself at my job"), and six items relatedness need satisfaction (α = .74; e.g., "At work, I feel part of a group"). Items were rated on a 5-point scale (1 – strongly disagree; 5 – strongly agree). Item-level correlations and descriptive statistics for the need satisfaction items are reported in Table S11 of Appendix 3 in the online supplements.

Positive and negative affect. Positive (5 items; α = .65; e.g., "determined") and negative (5 items; α = .73; e.g., "nervous") affects were assessed with the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). Participants rated how frequently they felt each listed affect using a 5-point scale (1 – never; 5 – always).

Job satisfaction. Job satisfaction was assessed using five items (α = .88; e.g., "I am satisfied with my work") from the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985), replacing the word ''life'' by ''work'' (Gillet, Fouquereau et al., 2018). Items were rated on a 7-point Likert-type scale (1 – strongly disagree; 7 – strongly agree).

Perceived organizational support. Perceived organizational support was assessed using eight items (α = .91; e.g., "My organization really cares about my well-being") from Eisenberger et al.'s (1986) Survey of Perceived Organizational Support. All items were rated on a 1 (strongly disagree) to 7 (strongly agree) response scale.

Organizational citizenship behaviors. Altruism (2 items; α = .78; e.g., "I willingly give of my time to help other agents who have work-related problems"), helping behaviors (4 items; α = .75; e.g., "I act as a "peacemaker" when colleagues have disagreements"), sportsmanship (4 items; α = .67; e.g., "I consume a lot of time complaining about trivial matters", reversed item), and civic virtue (3 items; α = .74; e.g., "I attend and actively participate in organization meetings") were assessed using subscales from Podsakoff, MacKensie, Moorman, and Fetter (1990). All items were rated on a 1 (strongly disagree) to 5 (strongly agree) response scale.

Work engagement. Work engagement was assessed using the nine-item Utrecht Work Engagement Scale (Schaufeli, Bakker, & Salanova, 2006) covering vigor (3 items; α = .82; e.g., "At

my work, I feel bursting with energy"), dedication (3 items; α = .90; e.g., "I am enthusiastic about my job"), and absorption (3 items; α = .87; e.g., "I feel happy when I am working intensely"). Responses were provided on a 7-point scale (1–never; 7–always).

Burnout. Shirom and Melamed's (2006) measure was used to assess physical fatigue (6 items, α = .93; e.g., "I feel tired"), cognitive weariness (5 items, α = .94; e.g., "I have difficulty concentrating"), and emotional exhaustion (3 items, α = .86; e.g., "I feel I am unable to be sensitive to the needs of coworkers"). Items were rated on a 7-point scale (1–never; 7–always).

Analyses

Models were estimated using Mplus 8 (Muthén & Muthén, 2017) robust weight least square estimator (WLSMV) to account for the ordinal nature of the Likert scales used in this study (Finney & DiStefano, 2013). When compared to Maximum Likelihood, WLSMV is slightly less efficient at handling missing data (Asparouhov & Muthén, 2010). However, this issue is minimized here given the low level of missing data at the item level (0-2.10%).

Participants' ratings of need satisfaction were represented according to CFA, bifactor-CFA, ESEM, and bifactor-ESEM models (Morin, Arens, & Marsh, 2016; Morin, Boudrias et al., 2016, 2017). In CFA, each item was allowed to load on the factor it was assumed to measure and no cross-loadings were allowed. This model included three correlated factors representing autonomy, competence, and relatedness needs satisfaction. In ESEM, the same three factors were estimated using a confirmatory oblique target rotation (Asparouhov & Muthén, 2009). More precisely, all main loadings specified a priori as being freely estimated, while the cross-loadings were constrained to be as close to zero as possible. In bifactor-CFA, all items were allowed to load on one G-Factor and one of three S-Factors (autonomy, competence, and relatedness). No cross-loadings were allowed and all factors were specified as orthogonal according to bifactor assumptions (Chen, West, & Sousa, 2006). In bifactor-ESEM, the same set of G- and S- factors were estimated using orthogonal bi-factor target rotation (Reise, Moore, & Maydeu-Olivares, 2011). More precisely, all items were a priori specified as related to the G-Factor. In addition, the three S-Factors were a priori defined using the same pattern of target and non-target factor loadings used in ESEM. In all models, an orthogonal method factor (defined by the negatively-worded items) was incorporated to account for the methodological artefact related to the negative wording of six of the need satisfaction items (Marsh, Scalas, & Nagengast, 2010).

We assessed model fit (Marsh, Hau, & Grayson, 2005) using the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA). Given the greater number of parameters estimated in ESEM relative to CFA, Marsh et al. (2009) reinforce the importance of the RMSEA and TLI, which include a correction for parsimony. According to typical interpretation guidelines (Yu, 2002), values greater than .90 and .95 for the CFI and TLI respectively indicate adequate and excellent fit to the data. Values smaller than .08 or .06 for the RMSEA respectively support acceptable and excellent model fit. When comparing nested models, typical guidelines suggest that models differing from one another by less than .01 on the CFI and TLI, or .015 on the RMSEA, can be considered to be equivalent (Chen, 2007).

As noted by Morin et al. (Morin, Arens, & Marsh, 2016; Morin, Boudrias et al., 2016, 2017), fit indices are not sufficient to guide the selection of the optimal model. Indeed, unmodelled cross-loadings result in inflated factor correlations in CFA, or inflated G-factor loadings in bifactor-CFA (e.g., Asparouhov et al., 2015). Likewise, an unmodelled G-factor produces inflated factor correlations in CFA, or inflated cross-loadings in ESEM. An examination of parameter estimates is thus required to select the best alternative. As suggested by Morin, Arens, and Marsh (2016), model comparison should start by contrasting CFA and ESEM. Here, statistical evidence shows that ESEM provides more exact estimates of factor correlations when cross-loadings are present while remaining unbiased otherwise (Asparouhov et al., 2015). For this reason, as long as the factors remain well-defined, the observation of a distinct pattern of factor correlations supports the ESEM solution. The second step involves contrasting the retained CFA or ESEM solutions with a bifactor alternative. Here, the key elements supporting a bifactor representation are the observation of: (1) an improved level of fit to the data; (2) a well-defined G-factor; and (3) at least some reasonably well-defined S-factors. Observing multiple cross-loadings higher than .100 or .200 in ESEM that are reduced in bifactor-ESEM is an additional source of evidence in favor of the bifactor solution (Morin, Arens, & Marsh, 2016). For all models, we report standardized parameter estimates and composite reliability coefficients associated with each factor. These coefficients were calculated from the model standardized parameters using McDonald's (1970) omega: $\omega = (\sum|\lambda_i|)^2 / [(\sum|\lambda_i|)^2 +$

$\sum \delta_i]$ where $|\lambda_i|$ are the factor loadings in absolute values, and δi, the item uniquenesses.

Finally, outcomes were added to each model as CFA factors specified as regressed on the need satisfaction factors. The fit of a model of total mediation was contrasted with a model of partial mediation. Mediation was tested via the calculation of indirect effects of perceived organizational support on the outcomes as mediated by the mediators (Morin et al., 2013). We used bias-corrected bootstrap (5000 bootstrap samples) confidence intervals (CI; Cheung & Lau, 2008) which should exclude zero to be considered statistically significant.

It should be noted that a pilot study was conducted on a smaller sample prior to the realization of the main study, mainly in order to provide further evidence of generalizability. The results from this pilot study, which essentially matched the main results reported in this manuscript, are fully reported in Appendix 2 of the online supplements.

Results

The goodness-of-fit of the various measurement models is reported in Table 1. Parameter estimates (factor loadings, uniqueness, and composite reliability) are reported in Table 2. CFA and ESEM factor correlations are reported in Table S12 of the online supplements (all complementary results from the main study can be found in Appendix 3 of these online supplements). Although the CFA was able to achieve an acceptable level of fit to the data, the alternative models were able to achieve an excellent level of fit across all indicators. In addition, both the ESEM and bifactor-ESEM solutions resulted in an equivalent, and substantial increase in model fit when compared to bifactor-CFA (ESEM: ΔCFI = +.011, ΔTLI = +.011; bifactor-ESEM: ΔCFI = +.015, ΔTLI = +.013). Based on this statistical information, either the ESEM or bifactor-ESEM solution could be retained. However, as noted above, model selection should be based on a complete examination of parameter estimates and theoretical conformity.

ESEM versus CFA

The CFA and ESEM solutions result in factors that are well-defined by strong factor loadings (CFA: λ = .358 to .865; ESEM: λ = .405 to .743) and satisfactory estimates of composite reliability (CFA: ω = .792 to .806; ESEM: ω = .650 to .717). In ESEM, many cross-loadings remain either not statistically significant (18 out of 32) or negligible (only three cross-loadings $\geq$ .200). Yet, the smaller factor correlations estimated in ESEM (r = .371 to .475) relative to CFA (r = .425 to .608) reinforces the need to incorporate cross-loadings.

ESEM versus bifactor-ESEM

The bifactor-ESEM solution reveals a G-Factor well-defined by strong positive loadings from most items (λ = .259 to .735, ω = .871), with the exception of the first relatedness need satisfaction item which mainly contributed to the definition of its a priori S-factor (λ = .573) relative to the G-Factor (λ = .193). Over and above this G-Factor, the three S-factors retained a satisfactory level of specificity: Autonomy (λ = .271 to .640, ω = .700), competence (λ = .410 to .645, ω = .695), and relatedness (λ = .260 to .618, ω = .725). Finally, the superiority of the bifactor-ESEM solution is also apparent from the reduced cross-loadings (no significant cross-loadings $\geq$ .200). This solution was retained for further analyses. Yet, for comparative purposes, outcomes were still integrated to all solutions.

Predictive models

The goodness-of-fit associated with the alternative bifactor-ESEM models of partial and total mediation are reported in the bottom section of Table 1. Comparable CFA, bifactor-CFA, and ESEM results are reported in Table S13 of the online supplements. Across all models, adding a direct path between perceptions of organizational support and the outcomes (i.e., partial mediation) results in a negligible or null increase in model fit. This observation supports a model of total mediation. The predictive results obtained for the bifactor-ESEM model of total mediation are reported in Table 3. The comparable CFA, ESEM, and bifactor-CFA are reported in Tables S14 to S16 of the online supplements. Latent correlations estimated between all constructs across model types are reported in Tables S17 to S20 of the online supplements. We only briefly summarize the differences between all four models, which essentially replicate the pattern of results from our pilot study summarized in Appendix 2 of the online supplements. These results show that: (a) ESEM and bifactor-ESEM afford a slightly cleaner differentiation of effects uniquely associated with each factor relative to CFA and bifactor-CFA; and (b) bifactor-CFA and bifactor-ESEM provide more precision in the identification of the relations attributable to global levels of need satisfaction relative to their specific levels of need

satisfaction relative to CFA and ESEM.

In the bifactor-ESEM solution, the results show consistent associations between global levels of need satisfaction and most outcomes, with the exceptions of negative affect and sportsmanship. Higher levels of global need satisfaction are associated with higher levels of positive affect, job satisfaction, altruism, helping behaviors, civic virtue, and work engagement (vigor, dedication, and absorption), and with lower levels of burnout (physical fatigue, cognitive weariness, and emotional exhaustion). Specific levels of imbalance in the satisfaction of the need for autonomy (i.e., when the satisfaction of this need is higher than that of the others) are related with lower levels of negative affect, physical fatigue, and cognitive weariness, as well as higher levels of job satisfaction, sportsmanship, civic virtue, vigor, and dedication. However, specific levels of imbalance in the satisfaction of the need for autonomy were not significantly related to positive affect, helping behaviors, absorption, and emotional exhaustion, and were even related to lower levels of altruism.

Relations involving specific levels of imbalance in the satisfaction of the needs for relatedness and competence were differentiated across outcomes. Higher levels of imbalance in relatedness need satisfaction were associated with higher levels of sportsmanship, but also with lower levels of negative affect and burnout (physical fatigue, cognitive weariness, and emotional exhaustion). Higher levels of imbalance in relatedness need satisfaction were also negatively associated with two dimensions of work engagement (dedication and absorption). Higher levels of imbalance in competence need satisfaction were related to lower levels of negative affect and cognitive weariness (but not emotional exhaustion or physical fatigue), as well as with higher levels of positive affect and sportsmanship. However, levels of imbalance in competence need satisfaction were negatively associated with helping behaviors. Finally, perceived organizational support was positively related with employees' specific levels of imbalance in autonomy need satisfaction as well as with their global levels of need satisfaction. However, these perceptions were also associated with lower specific levels of imbalance in competence need satisfaction, and presented no statistically significant associations with specific levels of imbalance in relatedness need satisfaction.

The presence of statistically significant relations between the predictor and some mediators, and between some of the mediators and the outcomes, suggest multiple mediation paths. With few exceptions, the indirect effects related to these suggested mediation paths were statistically significant. First, and as expected, the relations between perceived organizational support and most outcomes were mediated by global need satisfaction: (a) positive affect (indirect effect = .477; CI =.283/.783); (b) job satisfaction (1.005; CI= .585/3.037); (c) altruism (.295; CI =.148/.556); (d) helping behaviors (.177; CI= .075/.301); (e) civic virtue (.160; CI= .060/.307); (f) vigor (.331; CI =.207/.473); (g) dedication (.445; CI= .288/.660); and (h) absorption (.339; CI= .207/.508). However, the relations between perceived organizational support and physical fatigue (-.098; CI =-.200/.015) and cognitive weariness (-.124; CI =-.239/.006) were not mediated by global need satisfaction.

Second, the relations between perceived organizational support and some outcomes were mediated by employees' specific levels of imbalance in the satisfaction of the need for autonomy: (a) negative affect (indirect effect = -.634; CI = -2.443/-.327); (b) job satisfaction (1.647; CI = .928/5.784); (c) sportsmanship (.533; CI = .309/.976); (d) vigor (.236; CI = .081/.390); (e) physical fatigue (-.574; CI = -.889/-.380); and (f) cognitive weariness (-.523; CI = -1.169/-.300). In contrast, the relations between perceived organizational support and employees' levels of altruism (-.163; CI = -.431/.004), civic virtue (.142; CI = -.027/.309), and dedication (.166; CI = -.004/.311) were not significantly mediated by employees' specific levels of imbalance in the satisfaction of the need for autonomy. Finally, some of the relations involving perceived organizational support and the outcomes were significantly mediated by employees' specific levels of imbalance in the satisfaction of the need for competence: (a) positive affect (indirect effect = -.039; CI =-.125/-.004); (b) negative affect (.121; CI = .011/.753); (c) helping behaviors (.036; CI = .003/.105); (d) sportsmanship (-.061; CI = -.183/ -.014); and (e) cognitive weariness (.129; CI = .020/.387).

Discussion

The results supported the superiority of a bifactor-ESEM representation of employees' ratings of need satisfaction at work, when compared to alternative CFA, bifactor-CFA, and ESEM representations. This solution revealed well-defined factors representing employees' global levels of need satisfaction co-existing with factors reflecting imbalance in the specific levels of satisfaction of their needs for autonomy, competence, and relatedness relative to these global levels. These findings

thus provided a first evidence of replication of the results obtained by Sánchez-Oliva et al. (2017) in the work setting, using a distinct measure of need satisfaction (the W-BNS). Arguably, the replication of this improved representation of need satisfaction at work is a key contribution of the present study, and suggests that researchers should consider this framework as a starting point for their own research. More importantly, the current results also extended Sánchez-Oliva et al.'s (2017) study by the consideration of a wider range of predictor and outcome measures, and the assessment of mediated relations.

The Effects of Global and Specific Need Satisfaction on Work Outcomes

A key limitation of Sánchez-Oliva et al.'s (2017) study was their consideration of a restricted set of outcomes related to burnout. The present study sought to more precisely assess relations between global and specific (i.e., imbalance) levels of psychological need satisfaction and a more diversified set of outcomes. The results supported our expectations based on prior theoretical developments (Sheldon & Niemiec, 2006) and results (Sánchez-Oliva et al., 2017; Tóth-Király et al., 2018) in demonstrating the key role of employees' global levels of need satisfaction in the prediction of a variety of outcomes. More precisely, higher levels of global need satisfaction were associated with higher levels of positive affect, job satisfaction, altruism, helping behaviors, civic virtue, and work engagement. In addition, these global levels of need satisfaction were also associated with lower levels of burnout. Our results also supported the idea that specific levels of imbalance in the satisfaction of each need relative to all others also explained unique variability in outcomes' levels over and above that already explained by global levels of need satisfaction. Considering these findings, it is important to keep in mind that these specific factors cannot be interpreted as one would interpret a first-order factor reflecting, for example, the entirety of employees' satisfaction of their need for autonomy at work. Rather, our bifactor representation allowed us to obtain a direct estimate of the specificities, discrepancies, or degree of imbalance remaining in each of the specific needs over and above employees' global levels of need satisfaction.

Specific Imbalance in the Satisfaction of the Need for Autonomy. Specific levels of imbalance in the satisfaction of the need for autonomy reflect a need for autonomy that is satisfied to a greater extent than the other needs. These specific levels were found to be associated with lower levels of negative affect, physical fatigue, and cognitive weariness, as well as with higher levels of job satisfaction, sportsmanship, civic virtue, vigor, and dedication. However, specific levels of imbalance in autonomy need satisfaction were not significantly related to positive affect, helping behaviors, absorption, and emotional exhaustion. These results partially support those from Sánchez-Oliva et al. (2017), who found no relation between specific levels of imbalance in autonomy need satisfaction and levels of emotional exhaustion, depersonalization, and professional efficacy. Our findings also extended those results in showing that considering a wider range of outcomes, and an alternative conceptualization of burnout encompassing physical fatigue and cognitive weariness (Shirom & Melamed, 2006), could reveal more differentiated associations.

Our results also unexpectedly revealed a negative association between specific levels of imbalance in the satisfaction of the need for autonomy and altruism. More precisely, this result showed that having one's need for autonomy satisfied to a greater extent than one's needs for competence and relatedness could lead to a decrease in altruism. Autonomy is a need related to the experience of a sense of personal volition and freedom. This need is not fully compatible with altruism in which one has to let go of this personal freedom in order to devote time and efforts to unselfishly help others. The observation of non-significant associations between specific levels of imbalance in autonomy need satisfaction and helping behaviors is consistent with this interpretation. In contrast, and in line with prior studies (Chiniara & Bentein, 2016), higher specific levels of imbalance in autonomy need satisfaction were related to higher levels of sportsmanship and civic virtue. Thus, experiences of autonomy, volition, and freedom going beyond one's global levels of need satisfaction may lead to citizenship behaviors seeking to preserve and strengthen the growth of other members of the work context which has generated these feelings (Gagné & Deci, 2005).

Specific Imbalance in the Satisfaction of the Need for Relatedness. Our results revealed that specific levels of imbalance in the satisfaction of the need for relatedness were associated with higher levels of sportsmanship, but also with lower levels of negative affect and burnout components. These results are in line with those from prior research (Trépanier et al., 2013, 2016). They also support the idea that relatedness need satisfaction facilitates the internalization of work-related rules and

regulations, in turn leading to positive work-related attitudes and behaviors (Gagné & Deci, 2005). However, imbalance in employees' specific levels of relatedness need satisfaction was also negatively related to two dimensions of work engagement (dedication and absorption). Thus, employees who enjoy socializing far more than being autonomous or competent appear less likely to experience their work as meaningful (dedication) and engrossing (absorption). Similarly, Morin, Morizot, Boudrias, and Madore (2011) identified a subpopulation of employees characterized by a high level of affective commitment to their organization, colleagues, and customers, and thus globally enjoying positive social relationships at work. Yet, these employees did not appear to be overly motivated by achievement-related factors (such as their job or their career), by the simple pleasure of working, or by a desire to improve organizational or team effectiveness in an autonomous manner. Additional studies are needed to replicate the present results, and to identify the mechanisms underlying this negative relation.

Specific Imbalance in the Satisfaction of the Need for Competence. Specific levels of imbalance in the satisfaction of the need for competence relative to the other needs were not related to emotional exhaustion and physical fatigue, but presented negative associations with cognitive weariness. Prior research showed that employees who believe in their capabilities displayed lower levels of burnout (Albrecht, 2015). Thus, stronger feelings of competence may help to persevere beyond the benefits provided by autonomy and relatedness when faced with difficulties, and to interpret these difficulties as challenges to be met with optimism (e.g., Ventura, Salanova, & Llorens, 2015). Furthermore, competent employees may tend to be less frequently exposed to cognitive load and weariness because of their ability to obtain, protect, and retain valued resources (Hobfoll, 1989).

Imbalance in employees' levels of satisfaction of their need for competence was also negatively associated with helping behaviors. To understand this unexpected result, it is important to keep in mind that the satisfaction of this specific need already appears to be less contingent on external circumstances than that of the needs for relatedness and autonomy (Chiniara & Bentein, 2016). Furthermore, employees reporting higher levels of competence need satisfaction relative to all other needs (i.e., imbalance) should feel confident in their ability to be effective in a way that is relatively independent from external considerations (Chiniara & Bentein, 2016). This freedom from external and social contingencies might, in turn, make them less likely to reciprocate through helping behaviors.

Perceived Organizational Support and Need Satisfaction

In line with prior studies (Gillet et al., 2012) and with our expectations, perceived organizational support was found to be positively related to employees' global levels of need satisfaction, as well as to specific levels of imbalance in the satisfaction of their need for autonomy. In addition, no associations were found between perceived organizational support and employees' specific levels of imbalance in the satisfaction of their need for relatedness. In contrast, perceived organizational support was found to be negatively related to specific levels of imbalance in the satisfaction of the need for competence. This result suggests that perceiving high levels of organizational support may lead employees to believe that their organization doubts their competence. In this case, organizational support is not perceived as an organizational resource but may hinder the satisfaction of the need for competence (Gillet et al., 2012). Caution is thus needed in the provision of organizational support. However, future research needs to more extensively look at the effects of perceived organizational support on global and specific (imbalance) levels of need satisfaction, and try to unpack the mechanisms underlying this negative relation.

The Mediating Role of Global and Specific Need Satisfaction

As expected, the relations between perceived organizational support and most outcomes (positive affect, job satisfaction, altruism, helping behaviors, civic virtue, and work engagement) were mediated by global levels of need satisfaction. The relations between perceived organizational support and some outcomes (negative affect, job satisfaction, sportsmanship, vigor, physical fatigue, and cognitive weariness) were also mediated by specific levels of autonomy need satisfaction imbalance. Finally, the relations between perceived organizational support and five outcomes (positive affect, negative affect, helping behaviors, sportsmanship, and cognitive weariness) were significantly mediated by employees' specific levels of competence need satisfaction imbalance. These findings are important and confirm that perceived organizational support's relation with work outcomes flows through need satisfaction (Eisenberger & Stinglhamber, 2011). Moreover, our research extends recent

work (Gillet et al., 2012) by helping to: (a) identify which components of psychological need satisfaction are more strongly associated with perceived organizational support than others; and (b) by investigating the distinct mediating role of each need satisfaction component in the prediction of work outcomes. However, other mechanisms might also play a role in these relations (e.g., organizational dehumanization and identification), mechanisms which could become subjects of future investigation. Moreover, although our treatment of some variables as determinants (perceived organizational support), mediators (need satisfaction) or outcomes (e.g., positive and negative affect, work engagement) was based on theoretical considerations (Eisenberger & Stinglhamber, 2011; Ryan & Deci, 2017), our design did not allow us to rule out the possibility of reverse causality, reciprocal influence, or spuriousness. Future longitudinal research is needed to identify of the true directionality of these associations and confirm the mediating role of need satisfaction in the relationship between perceived organizational support and work outcomes.

Limitations and Directions for Future Research

The present research has some limitations. First, we relied on self-report measures that can be impacted by social desirability and self-report biases. We thus encourage researchers to conduct additional research using objective and informant-reported measures of turnover and performance. Second, we only considered perceived organizational support as a possible predictor. It would be interesting for future research to consider a more diversified set of predictors (e.g., ethical leadership, job design, emotional labor). Third, future studies are needed to assess the extent to which the current results, particularly the predictive results which are more unique to our study, would generalize to new and independent samples of employees. Finally, we relied on a convenience sample of French workers, making these results hard to generalize to broader populations. It would be important for future research to rely on more diversified (e.g., cultures, languages, professions) and representative samples.

Scoring Issues

Our results add to mounting research evidence supporting the value of adopting a bifactor-ESEM representation of need satisfaction ratings (Bidee et al., 2016; Gillet, Morin et al., 2018; Sánchez-Oliva et al., 2017; Tóth-Király et al., 2018). This representation provides a way to obtain a direct estimate of the global level of satisfaction of the needs for autonomy, competence, and relatedness coupled with an explicit estimate of the extent to which the satisfaction of each specific need can be considered to be in a state of imbalance relative to this global level (e.g., Sheldon & Niemiec, 2006). Researchers and practionners relying on more classical operationalisations of need satisfaction (e.g., scale scores, CFA) ignoring either form of multidimensionality (i.e., globability/specificity and cross-loadings) accounted for in a bifactor-ESEM model, are likely to obtained biased estimates relations involving need satisfaction ratings.

To avoid need satisfaction estimates reflecting a confusing mixture of global and specific variance likely to be tainted by multicollinearity, researchers and practicioners are thus invited to consider adopting a bifactor-ESEM representation of need satisfaction ratings in their own work. This recommandation strongly advocates in favor of a latent variable approach to research. Fortunately, evidence that models such as those used in this study work well even with relatively small sample sizes (Mai et al., 2018; also see our pilot study in the online supplements) suggest that the applicability of this approach might be more widespread than previously thought. Yet, this recommendation is not as easy to transpose to the professional context where practionners and organizations may still need to be able to manually score need satisfaction questionnaires. In these contexts, the present results suggest the need to develop automated scoring procedures relying on calculations similar to those involved in the generation of the factor scores used in the present study. As noted by Perreira et al. (2018), the Mplus statistical package could be used in such a manner on the basis of the parameter estimates obtained in the present study. A key advantage of this approach is that the resulting scores will be directly estimated in standardized units, and thus interpretable as a function of the sample mean and standard deviation, just like normed scores. Yet, as it is the case for the development of any norms, this consideration reinforces the importance for future research to rely on more representative samples prior to the development of any practically-useful scoring procedure. In addition, in doing so, it is also important to take to heart Fisher, Medaglia, and Jeronimus' (2018) warning that group-level results do not necessarily translate well to the study of intra-individual variations.

Practical Implications and Conclusions

From a practical perspective, our results suggest that managers should be particularly attentive to employees displaying low global levels of need satisfaction, as these workers appeared to be at risk

for a variety of work difficulties, including negative affect and burnout. Results from this study and from prior investigations (Gillet et al., 2012) revealed that higher levels of organizational support were associated with higher global levels of need satisfaction across dimensions. Thus, managers and practitioners should show concern for the extent to which their employees feel supported by their organizations and foster these perceptions. Gonzalez-Morales, Kernan, Becker, and Eisenberger (2018) provided evidence for the effectiveness of a brief support training program including four strategies (i.e., benevolence, sincerity, fairness, and experiential processing). Among other ways to achieve this objective, organizations might promote a supportive culture by providing to employees the resources they need to perform they job effectively, assurance of security during stressful times, and justice in the way policies are implemented and rewards distributed (Eisenberger & Stinglhamber, 2011). Still, managers must keep in mind the need to exercise restraint, and particularly to provide support that is not perceived as a doubt of employees' ability to avoid undesired effects on employees' specific levels of competence need satisfaction.

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Table 1

Goodness-of-Fit Statistics of the Measurement and Predictive Models

Description	χ^2 (*df*)	CFI	TLI	RMSEA	90% CI
Measurement Models					
CFA	371.050 (95)*	.942	.927	.075	[.067; .083]
Bifactor-CFA	199.684 (82)*	.975	.964	.052	[.043; .062]
ESEM	137.382 (69)	.986	.975	.044	[.033; .054]
Bifactor-ESEM	94.130 (56)*	.990	.978	.041	[.029; .053]
Predictive Models					
Bifactor-ESEM: Partial Mediation	5111.689 (2504)*	.946	.940	.045	[.043; .046]
Bifactor-ESEM: Total Mediation	5117.515 (2517)*	.946	.940	.044	[.043; .046]

Note. * $p < .01$; CFA: confirmatory factor analysis; ESEM: exploratory structural equation modeling; χ^2: WLSMV chi-square test of exact fit; *df*: degrees of freedom; CFI: comparative fit index; TLI: Tucker-Lewis index; RMSEA: root mean square error of approximation; 90% CI: 90% confidence interval for the RMSEA.

Table 2

Standardized Factor Loadings (λ) and Uniquenesses (δ)

	CFA		Bifactor-CFA			ESEM				Bifactor-ESEM				
Items	λ	δ	G-λ	S-λ	δ	λ	λ	λ	δ	G-λ	S-λ	S-λ	S-λ	δ
Autonomy														
Item 1	.865	.252	.820	.193	.290	**.556**	.174	.235	.365	**.680**	**.346**	.132	.148	.378
Item 2	.358	.582	.262	.449	.584	**.511**	-.141	*.003*	.599	**.283**	**.390**	-.102	*.042*	.581
Item 3	.409	.664	.298	.544	.582	**.655**	-.217	*-.017*	.592	**.259**	**.640**	-.097	.086	.498
Item 4	.765	.415	.683	.328	.426	**.682**	.137	*.029*	.411	**.649**	**.384**	*.069*	*-.032*	.426
Item 5	.664	.559	.605	.253	.570	**.580**	.229	*-.062*	.535	**.620**	**.271**	*.082*	-.145	.514
Item 6	.469	.593	.353	.536	.405	**.619**	-.085	*-.046*	.367	**.334**	**.516**	*-.021*	*.051*	.378
ω	.803			.650		.819					.700			
Competence														
Item 1	.655	.571	.431	.524	.540	*-.062*	**.672**	.092	.532	**.420**	*-.034*	**.536**	*.068*	.531
Item 2	.812	.341	.575	.509	.411	.124	**.703**	*.018*	.402	**.575**	*.022*	**.508**	*-.034*	.409
Item 3	.605	.634	.328	.642	.481	*-.075*	**.734**	*-.044*	.523	**.328**	*-.007*	**.645**	*-.004*	.477
Item 4	.711	.494	.512	.443	.542	.138	**.615**	*-.011*	.466	**.550**	*-.017*	**.410**	-.088	.521
ω	.792			.694			.794					.695		
Relatedness														
Item 1	.466	.759	.169	.543	.583	-.185	*-.061*	**.647**	.589	**.193**	*-.026*	*-.004*	**.573**	.408
Item 2	.797	.364	.556	.579	.355	.162	*-.076*	**.743**	.355	**.551**	.100	*-.059*	**.525**	.354
Item 3	.665	.528	.404	.507	.485	-.082	*.055*	**.689**	.469	**.375**	*.049*	*.072*	**.599**	.797
Item 4	.742	.449	.591	.368	.515	.188	.102	**.518**	.537	**.735**	-.120	-.148	**.263**	.580
Item 5	.640	.526	.365	.527	.422	*-.057*	*-.002*	**.684**	.448	**.339**	.102	*.043*	**.618**	.467
Item 6	.454	.794	.324	.307	.801	*.084*	*-.011*	**.405**	.800	**.362**	*-.005*	*-.066*	**.260**	.448
ω	.806		.869	.717				.809		.871			.725	

Note: CFA: confirmatory factor analysis; ESEM: exploratory structural equation modeling; B-CFA: bifactor-CFA; B-ESEM: bifactor-ESEM; G: global factor estimated as part of a bifactor model; S: specific factor estimated as part of a bifactor model; λ: factor loading; δ: item uniqueness; ω: omega coefficient of model-based composite reliability; target ESEM and B-ESEM factor loadings are indicated in bold; non-significant parameters ($p \geq .05$) are marked in italics.

Table 3

Results from the Predictive Analyses Conducted with the Final Bifactor-ESEM Solution of Total Mediation

	Predictors											
	Autonomy			Relatedness			Competence			Global Need Satisfaction		
Outcomes	*b*	*s.e.*	*β*	*b*	*s.e.*	*β*	*b*	*s.e.*	*β*	*b*	*s.e.*	*β*
Positive Affect	.011	.094	.010	-.119	.073	-.085	.229	.097*	.165	.846	.112**	.690
Negative Affect	-.837	.282**	-.639	-.475	.172**	-.289	-.709	.258**	-.438	.003	.123	.002
Job Satisfaction	2.173	.781**	.684	-.186	.156	-.047	.085	.207	.022	1.781	.497**	.513
Citizenship Behaviors												
Altruism	-.215	.106*	-.229	.070	.082	.059	-.177	.105	-.152	.523	.099**	.510
Helping	-.041	.084	-.047	.111	.062	.102	-.211	.082**	-.196	.314	.076**	.330
Sportsmanship	.703	.170**	.639	.195	.099*	.141	.356	.141*	.261	.032	.092	.027
Civic Virtue	.187	.078*	.214	-.016	.072	-.015	.028	.078	.026	.284	.068**	.297
Work Engagement												
Vigor	.311	.087**	.295	-.092	.062	-.069	.095	.078	.073	.586	.077**	.507
Dedication	.219	.099*	.190	-.198	.074**	-.138	.001	.091	.000	.788	.101**	.628
Absorption	.047	.094	.048	-.161	.069*	-.130	-.055	.083	-.045	.601	.092**	.556
Burnout												
Physical Fatigue	-.757	.131**	-.658	-.180	.076*	-.125	-.171	.093	-.120	-.173	.077*	-.138
Cognitive Weariness	-.690	.174**	-.551	-.310	.097**	-.198	-.757	.097**	-.489	-.219	.097**	-.160
Emotional Exhaustion	-.119	.071	-.115	-.599	.069**	-.460	-.076	.067	-.060	-.447	.075**	-.394

	Perceived Organizational Support		
	b	*s.e.*	*β*
Autonomy	.758	.083**	.604
Relatedness	.017	.077	.017
Competence	-.170	.073*	-.168
Global Satisfaction	.565	.075**	.492

Note. * $p \leq .05$; ** $p \leq .01$; ESEM: exploratory structural equation modeling; *b*: unstandardized regression coefficient; s.e.: standard error of the coefficient; *β*: standardized regression coefficient; All variables are latent factors a mean of 0 and a standard deviation of 1.

Online Supplemental Materials for:
The Forest and the Trees: Investigating the Globality and Specificity of Employees' Basic Need Satisfaction at Work

Authors' note:

These online technical appendices are to be posted on the journal website and hot-linked to the manuscript. If the journal does not offer this possibility, these materials can alternatively be posted on one of our personal websites (we will adjust the in-text reference upon acceptance).
We would also be happy to have some of these materials brought back into the main manuscript, or included as published appendices if you deem it useful. We developed these materials to provide additional technical information and to keep the main manuscript from becoming needlessly long.

Appendix 1. ***French and English Versions of all Items Used in this Research***

Item	English Version	French Version
Autonomy need satisfaction		
1	I feel like I can be myself at my job	J'ai le sentiment de pouvoir être moi-même dans mon travail
2	At work, I often feel like I have to follow other people's commands (*reversed item*)	Au travail j'ai souvent l'impression de devoir suivre les ordres des autres (*reversed item*)
3	If I could choose, I would do things at work differently (*reversed item*)	Si j'avais le choix, je m'y prendrais autrement au travail (*reversed item*)
4	The tasks I have to do at work are in line with what I really want to do	Mes tâches au travail correspondent à ce que je veux vraiment faire
5	I feel free to do my job the way I think it could best be done	Je me sens libre de faire mon travail tel que je l'entends
6	In my job, I feel forced to do things I do not want to do (*reversed item*)	A mon travail, je me sens forcé(e) de faire des choses que je ne veux pas faire (*reversed item*)
Competence need satisfaction		
1	I really master my tasks at my job	Je maîtrise bien mes tâches au travail
2	I feel competent at my job	Je me sens capable dans mon travail.
3	I am good at the things I do in my job	Je suis bon dans les choses que j'ai à faire dans mon travail.
4	I have the feeling that I can even accomplish the most difficult tasks at work	J'ai le sentiment de pouvoir accomplir même les tâches les plus difficiles au travail
Relatedness need satisfaction		
1	I don't really feel connected with other people at my job (*reversed item*)	Dans mon travail, je ne me sens pas vraiment de lien avec les autres personnes (*reversed item*)
2	At work, I feel part of a group	Au travail, j'ai le sentiment de faire partie d'un groupe
3	I don't really mix with other people at my job (*reversed item*)	A mon travail, je n'ai pas vraiment de contact avec les autres (*reversed item*)
4	At work, I can talk with people about things that really matter to me	Dans mon travail, je peux parler avec d'autres personnes de choses qui sont réellement importantes pour moi
5	I often feel alone when I am with my colleagues (*reversed item*)	Je me sens souvent seul lorsque nous sommes entre collègues (*reversed item*)
6	Some people I work with are close friends of mine	Certaines personnes avec qui je travaille sont de vrais amis
Positive affect		
1	Alert	Alerte
2	Inspired	Inspiré(e)
3	Determined	Déterminé(e)
4	Attentive	Attentif(ve)
5	Active	Actif(ve)
Negative affect		
1	Upset	Fâché(e)
2	Hostile	Hostile
3	Ashamed	Honteux(se)
4	Nervous	Nerveux(se)
5	Afraid	Anxieux(se)

Item	English Version	French Version
Life satisfaction		
1	In most ways my life is close to my ideal	En général, mon travail correspond de près à mes idéaux
2	The conditions of my life are excellent	Les conditions dans lesquelles je travaille sont excellentes
3	I am satisfied with my life	Je suis satisfait(e) de mon travail
4	So far I have gotten the important things I want in life	Jusqu'à maintenant, j'ai obtenu les choses importantes que je voulais retirer de mon travail
5	If I could live my life over, I would change almost nothing	Si je pouvais changer quoi que ce soit à mon travail, je n'y changerais presque rien
Perceived Organizational Support		
1	My organization cares about my opinions	Mon entreprise prend en compte mes opinions
2	My organization really cares about my well-being	Mon entreprise s'intéresse vraiment à mon bien-être
3	My organization strongly considers my goals and values	Mon entreprise respecte totalement mes valeurs
4	Help is available from my organization when I have a problem	Mon entreprise est prête à m'aider en cas de problème
5	My organization would forgive an honest mistake on my part	Mon entreprise pardonnerait une erreur involontaire de ma part
6	If given the opportunity, my organization would take advantage of me (*reversed item*)	Si elle le pouvait, mon entreprise profiterait de moi (*reversed item*)
7	My organization shows very little concern for me (*reversed item*)	Mon entreprise manifeste peu d'intérêt à mon égard (*reversed item*)
8	My organization is willing to help me when I need a special favor	Mon entreprise est prête à m'accorder une faveur si j'en ai besoin
Altruism		
1	I willingly take time out of my own busy schedule to help with recruiting or training new employees	Même lorsque je suis occupé(e), je suis disposé(e) à prendre du temps pour aider les nouveaux collègues à s'intégrer ou se former
2	I willingly give of my time to help other agents who have work-related problems	Je donne volontairement de mon temps pour aider des collègues qui rencontrent des difficultés dans leur travail
Helping Behaviors		
1	I am a stabilizing influence in the organization when dissension occurs	Lorsque j'entrevois des problèmes entre des collègues, j'essaie d'influencer leur relation dans le sens du consensus
2	I act as a "peacemaker" when colleagues have disagreements	J'agis en tant que conciliateur lorsque des collègues sont en désaccord
3	I take steps to try to prevent problems between colleagues	J'interviens pour essayer d'empêcher l'émergence de problèmes relationnels entre des collègues
4	I "touch base" with others before initiating actions that might affect them	Je pèse mes actes avant de faire quoi que ce soit dans le travail qui pourrait affecter les personnes avec lesquelles je travaille

Item	English Version	French Version
Sportsmanship		
1	I tend to make "mountains out of molehills" (makes problems bigger than they are) (*reversed item*)	J'ai plutôt tendance à exagérer les problèmes que rencontre mon entreprise (*reversed item*)
2	I always finds fault with what my organization is doing (*reversed item*)	Je trouve toujours à redire sur ce que fait mon entreprise (*reversed item*)
3	I always focuses on what is wrong with my organization rather than the positive side of it (*reversed item*)	Plutôt que de voir le côté positif de mon entreprise, j'ai tendance à voir ce qui ne va pas (*reversed item*)
4	I consume a lot of time complaining about trivial matters (*reversed item*)	Je passe beaucoup trop de temps sur des tâches qui me paraissent professionnellement insignifiantes (*reversed item*)
Civic Virtue		
1	I attend training/information sessions that agents are encouraged but not required to attend	J'assiste à des manifestations professionnelles pour lesquelles ma présence est encouragée mais pas formellement exigée
2	I attend and actively participate in organization meetings	Je participe activement à toute manifestation qui concerne de près ou de loin mon entreprise
3	I attends functions that are not required but help the organization image	Il m'arrive de faire des choses dans le travail qui ne sont pas formellement exigées de moi, mais qui contribuent à l'image de mon entreprise
Vigor		
1	At my work, I feel bursting with energy	Je déborde d'énergie pour mon travail
2	At my job, I feel strong and vigorous	Je me sens fort(e) et plein d'énergie pour faire ce métier
3	When I get up in the morning, I feel like going to work	Lorsque je me lève le matin, j'ai envie d'aller travailler
Dedication		
1	I am enthusiastic about my job	Je suis passionné(e) par mon travail
2	My job inspires me	Faire ce métier est stimulant
3	I am proud of the work that I do	Je suis fier(e) du travail que je fais
Absorption		
1	I feel happy when I am working intensely	Je suis content(e) lorsque je suis captivé(e) par mon activité
2	I am immersed in my work	Je suis littéralement plongé(e) dans mon travail
3	I get carried away when I am working	Je suis complètement absorbé(e) par mon travail
Physical Fatigue		
1	I feel tired	Je me sens fatigué(e)
2	I have no energy for going to work in the morning	Je n'ai aucune énergie pour aller au travail le matin
3	I feel physically drained	Je me sens physiquement vidé(e)
4	I feel fed up	J'en ai par-dessus la tête
5	I feel like my "batteries" are "dead"	J'ai l'impression que mes batteries sont à plat
6	I feel burned out	Je me sens épuisé(e)

Item	English Version	French Version
Cognitive Weariness		
1	My thinking process is slow	Je peine à réfléchir rapidement
2	I have difficulty concentrating	J'ai du mal à me concentrer
3	I feel I'm not thinking clearly	J'ai l'impression de ne pas avoir les idées claires
4	I feel I'm not focused in my thinking	J'ai l'impression que je n'arrive pas à regrouper mes pensées
5	I have difficulty thinking about complex things	J'ai des difficultés à réfléchir à des choses complexes
Emotional Exhaustion		
1	I feel I am unable to be sensitive to the needs of coworkers	Je me sens incapable de ressentir les besoins de mes collègues
2	I feel I am not capable of investing emotionally in coworkers	Je me sens incapable de m'investir émotionnellement avec mes collègues
3	I feel I am not capable of being sympathetic to coworkers	Je me sens incapable d'être proche de mes collègues

Appendix 2. *Pilot Study*

Participants and Procedures

Paper questionnaires were distributed by research assistants to a first convenience sample of 147 French police officers (115 policemen and 32 policewomen) involved in vocational training. These respondents were aged between 24 and 57 years (M = 38.05, SD = 6.24), had an average organizational tenure of 15.16 years (SD = 6.54), and an average tenure in the current position of 3.80 years (SD = 3.44). In terms of education, 2.7% of the participants had no diploma, 21.8% completed vocational training, 53.1% completed high school, and 21.8% completed university. Participants received a survey packet including the questionnaire, a cover letter explaining the objectives of the study, and a consent form stressing that participation was anonymous and voluntary. Questionnaires required approximately 15 minutes to complete, after which they were returned to the research assistants. All questionnaires were administered in French and instruments not already available in this language were adapted using a standardized back-translation procedure (van de Vijver & Hambleton, 1996). French and English versions of all items used in the present research are provided in Appendix 1.

Measures

***Work-related need satisfaction*.** Need satisfaction at work was assessed with the W-BNS scale (Van den Broeck, Vansteenkiste, De Witte, Soenens, & Lens, 2010). Four items assessed competence need satisfaction (α = .78; e.g., "I really master my tasks at my job"), six items autonomy need satisfaction (α = .79; e.g., "I feel like I can be myself at my job"), and six items relatedness need satisfaction (α = .74; e.g., "At work, I feel part of a group"). Items were rated on a 5-point scale (1 – strongly disagree; 5 – strongly agree). Item-level correlations and descriptive statistics for the need satisfaction items are reported in Table S1.

***Positive and negative affect*.** Positive (5 items; α = .67; e.g., "determined") and negative (5 items, α = .85; e.g., "nervous") affects were assessed with the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). Participants were asked to rate how frequently they felt each listed affect using a 5-point scale (1 – never; 5 – always).

***Job satisfaction*.** Job satisfaction was assessed using five items (α = .85; e.g., "I am satisfied with my work") from the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985) in which the word ''life'' was replaced by ''work'' (Gillet, Fouquereau, Vallerand, Abraham, & Colombat, 2018). Items were rated on a 7-point Likert-type scale (1 – strongly disagree; 7 – strongly agree).

Analyses

All models were estimated using Mplus 8 (Muthén & Muthén, 2017) robust weight least square estimator (WLSMV) to account for the ordered-categorical nature of the Likert scales used in this pilot study (Finney & DiStefano, 2013). All models were estimated using all of the available information. A limitation of WLSMV, when compared to Maximum Likelihood, is a slightly less efficient way of handling missing data (Asparouhov & Muthén, 2010), which is not an issue here given the low level of missing data at the item level (0%-.68%).

Participants' ratings of need satisfaction were represented according to CFA, bifactor-CFA, ESEM, and bifactor-ESEM models (Morin, Arens, & Marsh, 2016; Morin, Arens, Tran, & Caci, 2016; Morin, Boudrias et al., 2016, 2017). In CFA, each item was allowed to load on the factor it was assumed to measure and no cross-loadings were allowed. This model included three correlated factors representing autonomy, competence, and relatedness needs satisfaction. In ESEM, the same three factors were estimated using a confirmatory oblique target rotation (Asparouhov & Muthén, 2009), through which all main loadings were freely estimated while constraining the cross-loadings to be as close to zero as possible. In bifactor-CFA, all items were allowed to load on one G-Factor and one of three S-Factors corresponding to autonomy, competence, and relatedness needs satisfaction. No cross-loadings were allowed and all factors were specified as orthogonal according to bifactor assumptions (Chen, West, & Sousa, 2006). In bifactor-ESEM, the same set of three S-Factors and one G-Factor were estimated using orthogonal bi-factor target rotation (Reise, Moore, & Maydeu-Olivares, 2011). In this model, all items were allowed to define a G-Factor, while the three S-Factors were defined from the same pattern of target and non-target factor loadings used in ESEM. In all models, an orthogonal method factor (defined by the negatively-worded

items) was incorporated to account for the methodological artefact related to the negative wording of six of the need satisfaction items (Marsh, Scalas, & Nagengast, 2010). Model comparison followed the procedures used for the main study and outlined in the main manuscript. Outcomes were added to these models as CFA factors specified as regressed on the need satisfaction factors.

As noted by Morin et al. (Morin, Arens, & Marsh, 2016; Morin, Boudrias et al., 2016, 2017), fit indices are not sufficient to guide the selection of the optimal model. Indeed, unmodelled cross-loadings result in inflated factor correlations in CFA, or inflated G-factor loadings in bifactor-CFA (e.g., Asparouhov, Muthén, & Morin, 2015). Likewise, an unmodelled G-factor produces inflated factor correlations in CFA, or inflated cross-loadings in ESEM. An examination of parameter estimates is thus required to select the best alternative. As suggested by Morin, Arens, and Marsh (2016), model comparison should always start by contrasting CFA and ESEM. Here, statistical evidence shows that ESEM provides more exact estimates of factor correlations when cross-loadings are present while remaining unbiased otherwise (Asparouhov et al., 2015). For this reason, as long as the factors remain well-defined, the observation of a distinct pattern of factor correlations supports the ESEM solution. The second step involves contrasting the retained CFA or ESEM solutions with a bifactor alternative. Here, the key elements supporting a bifactor representation are the observation of: (1) an improved level of fit to the data; (2) a well-defined G-factor; and (3) at least some reasonably well-defined S-factors.

Finally, in order to assess more precisely the extent to which the final retained measurement model would be replicated across the samples used in this pilot study and in the main study, we proceeded to tests of measurement invariance (Millsap, 2011). These tests followed the sequential strategy adapted for ordered-categorical indicators (Morin, Arens, Tran, & Caci, 2016): (i) configural invariance, (ii) metric/weak invariance (loadings); (iii) scalar/strong invariance (loadings and thresholds); (iv) strict invariance (loadings, thresholds, and uniquenesses); (v) invariance of the latent variances-covariances (loadings, thresholds, uniquenesses, and variances-covariances); and (vi) latent means invariance (loadings, thresholds, uniquenesses, variances-covariances, and means).

Results

The goodness-of-fit indices of the various measurement models are reported in Table S2, and parameter estimates are reported in Table S3 (factor loadings, uniqueness, and composite reliability). CFA and ESEM factor correlations are reported in Table S4. The CFA model failed to achieve an acceptable level of fit according to the TLI and RMSEA, whereas the bifactor-CFA model achieves an acceptable level of fit based on all indices. In contrast, both the ESEM and bifactor-ESEM solutions achieve an excellent, and comparable, level of fit according to all indices. Based on this statistical information, either the ESEM or bifactor-ESEM solution could be retained. However, as noted in the main manuscript, model selection should always be based on a complete examination of the parameter estimates and theoretical conformity.

ESEM versus CFA. The CFA and ESEM solutions result in factors that are well-defined by strong factor loadings (CFA: λ = .385 to .857; ESEM: λ = .470 to .923) and satisfactory estimates of composite reliability (CFA: ω = .802 to .866; ESEM: ω = .814 to .858). In ESEM, despite the fact that multiple cross-loadings are small and not statistically significant (15 out of 32 possible cross-loadings), multiple cross-loadings remain relatively strong (8 cross-loadings $\geq$.200). These cross-loadings reinforce the need to incorporate this source of construct-relevant multidimensionality, but also suggests that a global factor might need to be included. The factor correlations associated with both solutions similarly reinforce the need to incorporate cross-loadings to the model, as these are substantially smaller in ESEM (r = .307 to .393) relative to CFA (r = .532 to .612).

ESEM versus bifactor-ESEM. The bifactor-ESEM solution reveals a G-Factor well-defined by strong and positive loadings from most items (λ = .302 to .630, ω = .899), with the exception of the last item from the autonomy need satisfaction subscale which mainly contributed to the definition of its a priori S-factor (λ = .544) relative to the G-Factor (λ = .105). Over and above this G-Factor, the items associated with the autonomy (λ = .410 to .712, ω =.777) and competence (λ = .332 to .806, ω = .799) needs satisfaction S-factors retain a satisfactory level of specificity. This is not the case for the relatedness need satisfaction S-factor which was weakly defined by most items (λ = .087 to .761, ω = .552), suggesting that the items used to assess the relatedness need satisfaction provide a clearer reflection of workers' global

levels of balance in need satisfaction than of deviations in the satisfaction of this specific need relative to that global level. More precisely, this reveals that, among the sample under study, this specific need tends to present only negligible amounts of discrepancies or imbalance relative to workers' global levels of need satisfaction. Finally, the superiority of the bifactor-ESEM solution is also apparent from the reduced cross-loadings (i.e., three significant cross-loadings ≥ .200 and 28 are not statistically significant). This solution was retained for the outcome analyses. However, for comparative purposes, outcomes were integrated to all solutions.

***Predictive Models*.** The goodness-of-fit of the predictive models is reported in the bottom section of Table S2, whereas the relations between the need satisfaction factors and the outcomes are reported in Table S5. Latent correlations estimated between all constructs across model types are reported in Tables S6 to S9. When we first look at the CFA and ESEM results, it is noteworthy that the ESEM solution, possibly because it is able to achieve a greater level of differentiation among the factors, identifies a greater number of statistically significant relations. More precisely, the CFA solution suggests that levels of competence need satisfaction are associated with higher levels of positive affect and lower levels of negative affect, whereas levels of autonomy need satisfaction are associated with lower levels of negative affect, and higher levels of positive affect and job satisfaction. In addition to replicating these relations, the ESEM solution also identifies relations between relatedness need satisfaction and higher levels of positive affect and job satisfaction, as well as lower levels of negative affect. This greater prediction accuracy of the ESEM solution illustrates the importance of relying on measurement models able to achieve more accurate factor definitions (Asparouhov et al., 2015). Similar differences also appear we consider the bifactor-CFA and bifactor-ESEM solutions. In addition, when we look at the relations estimated within the bifactor solutions, their added-value relative to the CFA and ESEM solutions is obvious: Both solutions show that many relations attributed to the autonomy, competence, and relatedness needs satisfaction factors in the CFA and ESEM solutions can be entirely attributed by participants' global levels of need satisfaction. However, participants' specific levels of relatedness and competence needs satisfaction also present direct positive relations with positive affect in the bifactor-ESEM solution, suggesting that this outcome may present a greater level of sensitivity to specific need satisfaction levels.

Measurement Invariance with Results from the Main Study. Tests of measurement invariance are specifically designed to assess the extent to which observed deviations in parameter estimates can be assumed to reflect random sampling variations or true differences across the samples used in the pilot study and in the main study (Millsap, 2011). The results from these tests are reported in Table S12 of the online supplements and support the configural, weak, and strong invariance of this model across samples. However, strict invariance was not supported (ΔCFI/TLI = -.014). A detailed examination of the results led us to relax equality constraints across samples for the uniquenesses of three items, leading to a satisfactory model of partial strict invariance. These three items (Autonomy Need Satisfaction 2, Relatedness Need Satisfaction 1, and Competence Need Satisfaction 4) presented lower levels of measurement errors in the pilot sample relative to the main sample, consistent with the much smaller size of our pilot sample. Starting from this model, the invariance of the latent variance-covariances and latent means was also supported. These results support the comparability of the bifactor-ESEM solution across samples and suggest that the more weakly defined relatedness need satisfaction S-factor identified in this pilot sample might have been related to random sampling variations.

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Table S1

Item-Level Correlation Matrix for the Need Satisfaction Items (Pilot Study)

	Mean	Variance	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Item 1 Autonomy need satisfaction	3.54	.68	-														
2. Item 2 Autonomy need satisfaction	2.95	.80	.43	-													
3. Item 3 Autonomy need satisfaction	2.85	1.10	.28	.34	-												
4. Item 4 Autonomy need satisfaction	3.16	.69	.43	.40	.40	-											
5. Item 5 Autonomy need satisfaction	3.25	.79	.46	.47	.38	.45	-										
6. Item 6 Autonomy need satisfaction	3.31	.84	.35	.38	.32	.27	.37	-									
7. Item 1 Competence need satisfaction	4.29	.39	.37	.25	.19	.38	.30	.17	-								
8. Item 2 Competence need satisfaction	3.90	.48	.27	.35	*.14*	.21	*.08*	.23	.44	-							
9. Item 3 Competence need satisfaction	3.66	.42	.23	.20	*.08*	.22	*.08*	*.11*	.26	.60	-						
10. Item 4 Competence need satisfaction	3.60	.53	.39	.32	.23	.40	.25	.24	.46	.52	.52	-					
11. Item 1 Relatedness need satisfaction	3.75	.90	*.15*	.16	*.09*	*.16*	*.11*	*.11*	.21	*.16*	.22	.26	-				
12. Item 2 Relatedness need satisfaction	3.97	.74	.45	.25	.24	.37	.31	*.08*	.26	.20	*.13*	.27	.25	-			
13. Item 3 Relatedness need satisfaction	4.22	.72	.28	*.15*	.25	.20	*.07*	.23	.24	.18	.19	.27	.49	.26	-		
14. Item 4 Relatedness need satisfaction	3.78	.71	.46	.21	.34	.31	.33	.21	.27	*.09*	*.09*	.34	.29	.47	.47	-	
15. Item 5 Relatedness need satisfaction	4.10	.85	.21	*.13*	*.12*	*.11*	*-.04*	*.08*	.23	*.14*	*.16*	.26	.39	.28	.47	.28	-
16. Item 6 Relatedness need satisfaction	3.62	1.15	*.12*	*-.05*	*-.01*	*.04*	*-.03*	*-.10*	.17	.18	.26	*.14*	.26	.21	.37	.24	.31

Note. Non-statistically significant correlations ($p > .05$) are marked in italics.

Table S2

Goodness-of-Fit Statistics of the Models Estimated in the Pilot Study

Description	χ^2 (*df*)	CFI	TLI	RMSEA	90% CI
Measurement Models					
CFA	218.064 (95)*	.916	.894	.094	[.078; .110]
Bifactor-CFA	145.635 (82)*	.957	.937	.073	[.053; .092]
ESEM	73.112 (69)	.997	.995	.020	[.000; .053]
Bifactor-ESEM	58.202 (56)*	.999	.997	.016	[.000; .055]
Predictive Models					
CFA	689.185 (413)*	.935	.927	.067	[.059; .076]
Bifactor-CFA	638.920 (397)*	.943	.933	.064	[.055; .073]
ESEM	608.226 (387)*	.948	.937	.062	[.053; .072]
Bifactor-ESEM	593.051 (371)*	.948	.934	.064	[.054; .073]

Note. * $p < .01$; CFA: confirmatory factor analysis; ESEM: exploratory structural equation modeling; χ^2: WLSMV chi-square test; *df*: degrees of freedom; CFI: comparative fit index; TLI: Tucker-Lewis index; RMSEA: root mean square error of approximation; 90% CI: 90% confidence interval for the RMSEA.

Table S3

Standardized Factor Loadings (λ) and Uniquenesses (δ) in the Pilot Study

	CFA		Bifactor-CFA			ESEM				Bifactor-ESEM				
Items	λ	δ	G-λ	S-λ	δ	λ	λ	λ	δ	G-λ	S-λ	S-λ	S-λ	δ
Autonomy														
Item 1	.831	.310	.775	.187	.364	**.523**	.155	.310	.412	**.615**	**.410**	*.103*	*.155*	.419
Item 2	.680	.529	.495	.494	.511	**.606**	.245	*-.128*	.495	**.379**	**.531**	*.157*	*-.131*	.494
Item 3	.561	.685	.441	.384	.657	**.545**	*-.031*	*.096*	.641	**.302**	**.464**	*.000*	*.129*	.647
Item 4	.681	.537	.580	.351	.541	**.584**	*.112*	*.115*	.538	**.533**	**.476**	*.001*	*-.089*	.481
Item 5	.639	.592	.445	.650	.379	**.834**	*-.066*	*-.039*	.351	**.372**	**.712**	*-.085*	*-.028*	.347
Item 6	.518	.731	.378	.405	.690	**.527**	.143	-.160	.560	***.105***	**.544**	.223	*.102*	.439
ω	.819			.660		.814					.777			
Competence														
Item 1	.792	.373	.677	.305	.449	.266	**.470**	.206	.476	**.619**	*.202*	**.332**	*.005*	.466
Item 2	.762	.419	.431	.775	.214	*.048*	**.923**	-.143	.207	**.399**	*.099*	**.806**	*-.057*	.177
Item 3	.728	.471	.399	.728	.311	-.118	**.861**	*.026*	.291	**.470**	*-.079*	**.681**	*-.073*	.303
Item 4	.857	.266	.675	.441	.350	.231	**.611**	.138	.379	**.592**	.197	**.478**	*.028*	.381
ω	.866			.793			.858					.799		
Relatedness														
Item 1	.488	.540	.358	.368	.532	*-.076*	*.100*	**.508**	.570	**.518**	-.160	*-.023*	***.087***	.543
Item 2	.710	.496	.593	.281	.569	.294	*-.037*	**.534**	.546	**.630**	*.159*	*-.118*	***.180***	.531
Item 3	.651	.247	.470	.565	.230	*-.067*	*.029*	**.729**	.182	**.581**	*-.160*	*-.003*	***.364***	.185
Item 4	.779	.393	.622	.363	.482	.345	-.175	**.678**	.365	**.536**	*.258*	*-.085*	**.761**	.060
Item 5	.483	.480	.330	.487	.492	-.184	*.121*	**.605**	.485	**.554**	-.264	*-.006*	***.135***	.459
Item 6	.385	.852	*.170*	.597	.614	-.319	.141	**.585**	.623	**.447**	-.358	*.051*	***.197***	.630
ω	.802			.708	.893			.827		.899			.552	

Note: CFA: confirmatory factor analysis; ESEM: exploratory structural equation modeling; B-CFA: bifactor-CFA; B-ESEM: bifactor-ESEM; G: global factor estimated as part of a bifactor model; S: specific factor estimated as part of a bifactor model; λ: factor loading; δ: item uniqueness; ω: omega coefficient of model-based composite reliability; target ESEM and B-ESEM factor loadings are indicated in bold; non-significant parameters ($p \geq .05$) are marked in italics.

Table S4

Latent Factor Correlations for the CFA and ESEM Solutions (Pilot Study)

	CFA			ESEM		
	Autonomy	Competence	Relatedness	Autonomy	Competence	Relatedness
Autonomy	-			-		
Competence	.590	-		.307	-	
Relatedness	.612	.532	-	.333	.393	-

Note. CFA: confirmatory factor analysis; ESEM: exploratory structural equation modeling; all correlations are statistically significant ($p < .01$); all variables are latent factors with a mean of 0 and a standard deviation of 1.

Table S5

Results from the Predictive Analyses Conducted in the Pilot Study

	Positive Affect			Negative Affect			Job Satisfaction		
Predictors	*b*	*s.e.*	*β*	*b*	*s.e.*	*β*	*b*	*s.e.*	*β*
CFA									
Autonomy	.326	.162*	.229	-.674	.185**	-.463	.961	.179**	.664
Relatedness	.256	.169	.179	-.108	.159	-.074	.111	.157	.077
Competence	.605	.134**	.424	-.423	.128**	-.291	.023	.134	.016
ESEM									
Autonomy	.450	.110**	.311	-.660	.135**	-.451	.841	.123**	.580
Relatedness	.340	.130**	.235	-.252	.122*	-.172	.306	.119**	.212
Competence	.586	.122**	.405	-.482	.116**	-.329	.129	.099	.089
Bifactor-CFA									
Autonomy (S-factor)	.183	.118	.128	-.440	.128**	-.301	.513	.142**	.352
Relatedness (S-factor)	.187	.126	.131	-.146	.121	-.100	.063	.124	.044
Competence (S-factor)	.399	.125**	.280	-.316	.130*	-.216	-.010	.104	-.007
Global (G-factor)	.901	.131**	.631	-.907	.132**	-.620	.921	.122**	.633
Bifactor-ESEM									
Autonomy (S-factor)	.534	.314	.338	-1.248	.909	-.584	1.050	.639	.552
Relatedness (S-factor)	.386	.161*	.245	-.432	.333	-.202	.336	.222	.177
Competence (S-factor)	.550	.154**	.348	-.582	.314	-.272	.085	.130	.045
Global (G-factor)	.871	.174**	.551	-1.221	.605*	-.571	1.181	.420**	.621

Note. * $p \leq .05$; ** $p \leq .01$; CFA: confirmatory factor analysis; ESEM: exploratory structural equation modeling; *b*: unstandardized regression coefficient; s.e.: standard error of the coefficient; *β*: standardized regression coefficient; All variables are latent factors a mean of 0 and a standard deviation of 1.

Table S6

Latent Correlations between the Variables in the Pilot Study in the Confirmatory Factor Analytic Model

	1	2	3	4	5	6	7
1. Age	--						
2. Gender (1 male; 2 female)	-.121	--					
3. Autonomy need satisfaction	.052	.114	--				
4. Relatedness need satisfaction	-.178	.041	.618**	--			
5. Competence need satisfaction	.049	-.071	.585**	.529**	--		
6. Negative affect	.075	-.057	-.679**	-.514**	-.601**	--	
7. Positive affect	-.026	.022	.587**	.544**	.652**	-.434**	--
8. Job satisfaction	-.005	-.014	.720**	.495**	.445**	-.559**	.708**

Note. * $p < .05$; ** $p < .01$; all variables (with the exception of age and gender) are latent factors with a mean of 0 and a standard deviation of 1.

Table S7

Latent Correlations between the Variables in the Pilot Study in the Exploratory Structural Equation Modeling Solution

	1	2	3	4	5	6	7
1. Age	--						
2. Gender (1 male; 2 female)	-.121	--					
3. Autonomy need satisfaction	.077	.075	--				
4. Relatedness need satisfaction	-.209*	.064	.321**	--			
5. Competence need satisfaction	.073	-.055	.353**	.397**	--		
6. Negative affect	.075	-.057	-.615**	-.541**	-.461**	--	
7. Positive affect	-.026	.022	.522**	.598**	.503**	-.434**	--
8. Job satisfaction	-.005	-.014	.684**	.359**	.448**	-.559**	.708**

Note. * $p < .05$; ** $p < .01$; all variables (with the exception of age and gender) are latent factors with a mean of 0 and a standard deviation of 1.

Table S8

Latent Correlations between the Variables in the Pilot Study in the Bifactor-Confirmatory Factor Analytic Model

	1	2	3	4	5	6	7	8
1. Age	--							
2. Gender (1 male; 2 female)	-.121	--						
3. Global need satisfaction	-.060	.027	--					
4. Autonomy need satisfaction	.179	.118	0	--				
5. Relatedness need satisfaction	-.219*	.062	0	0	--			
6. Competence need satisfaction	.185	-.121	0	0	0	--		
7. Negative affect	.075	-.057	-.616**	-.306**	-.098	-.217*	--	
8. Positive affect	-.025	.022	.633**	.129	.120	.275**	-.434**	--
9. Job satisfaction	-.006	-.014	.631**	.359**	.035	-.008	-.559**	.708**

Note. * $p < .05$; ** $p < .01$; all variables (with the exception of age and gender) are latent factors with a mean of 0 and a standard deviation of 1.

Table S9

Latent Correlations between the Variables in the Pilot Study in the Bifactor-Exploratory Structural Equation Modeling Solution

	1	2	3	4	5	6	7	8
1. Age	--							
2. Gender (1 male; 2 female)	-.121	--						
3. Global need satisfaction	.122	.032	--					
4. Autonomy need satisfaction	-.444	.235	0	--				
5. Relatedness need satisfaction	-.353	.078	0	0	--			
6. Competence need satisfaction	.099	-.097	0	0	0	--		
7. Negative affect	.076	-.057	-.539**	-.805*	-.277**	-.236	--	
8. Positive affect	-.026	.022	.547**	.382	.351**	.249**	-.434**	--
9. Job satisfaction	-.005	-.014	.616**	.627*	.047	.183	-.559**	.708**

Note. * $p < .05$; ** $p < .01$; all variables (with the exception of age and gender) are latent factors with a mean of 0 and a standard deviation of 1.

Table S10

Goodness-of-Fit Statistics of the Measurement Invariance Models

Description	χ^2 (*df*)	CFI	TLI	RMSEA	90% CI	$\Delta\chi^2$	Δdf	ΔCFI	ΔTLI	ΔRMSEA
Configural invariance	148.833 (112)*	.994	.987	.031	[.016; .044]	-	-	-	-	-
Weak invariance	241.830 (165)*	.987	.981	.037	[.027; .047]	94.792*	53	-.007	-.006	+.006
Strong invariance	315.525 (206)*	.982	.979	.040	[.031; .048]	86.903*	41	-.005	-.002	+.003
Strict invariance	415.570 (222)*	.968	.965	.051	[.043; .059]	110.620*	16	-.014	-.014	+.011
Partial strict invariance	355.214 (219)*	.977	.975	.043	[.035; .051]	52.945*	13	-.005	-.004	+.003
Latent variance-covariance invariance	377.887 (230)*	.975	.974	.044	[.036; .052]	32.869*	11	-.002	-.001	+.001
Latent means invariance	424.342 (235)*	.968	.968	.049	[.042; .056]	29.754*	5	-.007	-.006	+.005

Note. * $p < .01$; CFA: confirmatory factor analysis; ESEM: exploratory structural equation modeling; χ^2: WLSMV chi-square test of exact fit; *df*: degrees of freedom; CFI: comparative fit index; TLI: Tucker-Lewis index; RMSEA: root mean square error of approximation; 90% CI: 90% confidence interval for the RMSEA; Δ: change in goodness-of-fit in relation to the preceding model.

Appendix 3. ***Additional Results from the Main Study***

Table S11

Item-Level Correlation Matrix for the Need Satisfaction Items (Main Study)

	Mean	Variance	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Item 1 Autonomy need satisfaction	3.82	1.00	-														
2. Item 2 Autonomy need satisfaction	3.07	1.26	.29	-													
3. Item 3 Autonomy need satisfaction	2.86	1.29	.37	.34	-												
4. Item 4 Autonomy need satisfaction	3.25	1.02	.53	.27	.37	-											
5. Item 5 Autonomy need satisfaction	3.58	1.06	.46	.28	.24	.47	-										
6. Item 6 Autonomy need satisfaction	3.38	1.39	.34	.45	.42	.38	.32	-									
7. Item 1 Competence need satisfaction	4.48	.37	.25	*.04*	*.05*	.18	.26	*.08*	-								
8. Item 2 Competence need satisfaction	4.08	.60	.41	.09	.11	.36	.35	.16	.38	-							
9. Item 3 Competence need satisfaction	4.05	.49	.21	*.05*	*.01*	.20	.22	*.07*	.38	.38	-						
10. Item 4 Competence need satisfaction	3.78	.70	.36	*.05*	.10	.37	.27	.15	.31	.45	.37	-					
11. Item 1 Relatedness need satisfaction	3.69	1.36	.18	.14	*.05*	.09	*.02*	.16	*.06*	*.01*	*.05*	*.03*	-				
12. Item 2 Relatedness need satisfaction	3.81	1.20	.42	.18	.23	.32	.20	.23	.14	.24	*.04*	.20	.38	-			
13. Item 3 Relatedness need satisfaction	4.24	.92	.31	.16	.13	.20	.11	.17	.15	.18	*.09*	.10	.35	.42	-		
14. Item 4 Relatedness need satisfaction	3.91	.88	.39	.19	.14	.36	.34	.17	.18	.25	.10	.28	.24	.43	.36	-	
15. Item 5 Relatedness need satisfaction	4.05	1.06	.26	.22	.20	.21	.10	.22	.12	.17	.13	.10	.37	.43	.43	.33	-
16. Item 6 Relatedness need satisfaction	3.50	1.52	.28	.15	.14	.13	.14	.10	.10	.15	*.08*	.13	.18	.32	.17	.34	.25

Note. Non-statistically significant correlations ($p > .05$) are marked in italics.

Table S12

Latent Factor Correlations for the CFA and ESEM Solutions (Main Study)

	CFA			ESEM		
	Autonomy	Competence	Relatedness	Autonomy	Competence	Relatedness
Autonomy	-			-		
Competence	.606	-		.441	-	
Relatedness	.608	.425	-	.475	.371	-

Note. CFA: confirmatory factor analysis; ESEM: exploratory structural equation modeling; all correlations are statistically significant ($p < .01$); all variables are latent factors with a mean of 0 and a standard deviation of 1.

Table S13

Goodness-of-Fit Statistics of the Predictive Models Estimated in the Main Study

Description	χ^2 (*df*)	CFI	TLI	RMSEA	90% CI	$\Delta\chi^2$	Δdf	ΔCFI	ΔTLI	ΔRMSEA
CFA: Partial Mediation	5743.349 (2560)*	.934	.928	.049	[.047; .050]	-	-	-	-	-
CFA: Total Mediation	5796.456 (2573)*	.933	.928	.049	[.047; .051]	91.765*	13	-.001	.000	.000
Bifactor-CFA: Partial Mediation	5188.096 (2530)*	.945	.939	.045	[.043; .047]	-	-	-	-	-
Bifactor-CFA: Total Mediation	5196.058 (2543)*	.945	.940	.045	[.043; .046]	48.756*	13	.000	+.001	.000
ESEM: Partial Mediation	5229.178 (2531)*	.944	.938	.045	[.043; .047]	-	-	-	-	-
ESEM: Total Mediation	5214.435 (2544)*	.944	.939	.045	[.043; .047]	39.824*	13	.000	+.001	.000
Bifactor-ESEM: Partial Mediation	5111.689 (2504)*	.946	.940	.045	[.043; .046]	-	-	-	-	-
Bifactor-ESEM: Total Mediation	5117.515 (2517)*	.946	.940	.044	[.043; .046]	46.782*	13	.000	.000	-.001

Note. * $p < .01$; CFA: confirmatory factor analysis; ESEM: exploratory structural equation modeling; χ^2: WLSMV chi-square test of exact fit; *df*: degrees of freedom; CFI: comparative fit index; TLI: Tucker-Lewis index; RMSEA: root mean square error of approximation; 90% CI: 90% confidence interval for the RMSEA; Δ: change in goodness-of-fit in relation to the preceding model.

Table S14

Results from the Predictive Analyses Conducted in the Main Study with the CFA Solution of Total Mediation

	Predictors								
	Autonomy			Relatedness			Competence		
Outcomes	*b*	*s.e.*	*β*	*b*	*s.e.*	*β*	*b*	*s.e.*	*β*
Positive Affect	.233	.044**	.243	.198	.052**	.172	.548	.056**	.457
Negative Affect	-.264	.043**	-.313	-.157	.047**	-.155	-.208	.047**	-.198
Job Satisfaction	1.339	.124**	.735	.386	.084**	.177	.576	.096**	.254
Citizenship Behaviors									
Altruism	.033	.033	.042	.252	.049**	.267	.160	.046**	.163
Helping	.108	.037**	.140	.200	.044**	.216	.021	.044	.022
Sportsmanship	.285	.042**	.337	.148	.054**	.145	.195	.051**	.185
Civic Virtue	.170	.042**	.211	.147	.051**	.152	.210	.049**	.209
Work Engagement									
Vigor	.435	.041**	.455	.114	.046*	.100	.333	.049**	.281
Dedication	.501	.039**	.509	.092	.050	.078	.322	.053**	.263
Absorption	.290	.033**	.342	.090	.043*	.089	.242	.045**	.229
Burnout									
Physical Fatigue	-.469	.036**	-.507	-.166	.045**	-.150	-.105	.046*	-.091
Cognitive Weariness	-.251	.034**	-.278	-.181	.040**	-.167	-.398	.043**	-.354
Emotional Exhaustion	-.098	.037**	-.104	-.581	.051**	-.519	-.177	.047**	-.152
	Perceived Organizational Support								
	b	*s.e.*	*β*						
Autonomy	.916	.079**	.675						
Relatedness	.530	.053**	.468						
Competence	.434	.051**	.398						

Note. * $p \leq .05$; ** $p \leq .01$; CFA: confirmatory factor analysis; *b*: unstandardized regression coefficient; s.e.: standard error of the coefficient; *β*: standardized regression coefficient; all variables are latent factors with a mean of 0 and a standard deviation of 1.

Table S15

Results from the Predictive Analyses Conducted in the Main Study with the ESEM Solution of Total Mediation

	Predictors								
	Autonomy			Relatedness			Competence		
Outcomes	*B*	*s.e.*	*β*	*b*	*s.e.*	*β*	*b*	*s.e.*	*β*
Positive Affect	.334	.066**	.340	.000	.070	.000	.595	.081**	.450
Negative Affect	-.318	.064**	-.379	-.144	.067*	-.132	-.071	.066	-.063
Job Satisfaction	2.981	.828**	1.039	-.552	.252*	-.148	-.011	.175	-.003
Citizenship Behaviors									
Altruism	.044	.055	.057	.229	.071**	.226	.169	.066**	.162
Helping	.126	.057*	.164	.199	.065**	.199	-.030	.064	-.030
Sportsmanship	.465	.071**	.545	-.025	.076	-.022	-.052	.072	-.045
Civic Virtue	.312	.066**	.389	-.030	.080	-.029	.080	.067	.075
Work Engagement									
Vigor	.572	.069**	.592	-.098	.067	-.078	.242	.068**	.186
Dedication	.614	.067**	.610	-.141	.071*	-.108	.315	.076**	.233
Absorption	.366	.054**	.427	-.076	.062	-.068	.250	.067**	.217
Burnout									
Physical Fatigue	-.662	.065**	-.693	.019	.063	.015	.153	.066*	.119
Cognitive Weariness	-.338	.053**	-.381	-.091	.056	-.079	-.273	.056**	-.230
Emotional Exhaustion	-.098	.056	-.103	-.677	.075**	-.550	-.088	.064	-.069
	Perceived Organizational Support								
	B	*s.e.*	*β*						
Autonomy	.934	.071**	.683						
Relatedness	.335	.048**	.317						
Competence	.196	.051**	.192						

Note. * $p \leq .05$; ** $p \leq .01$; ESEM: exploratory structural equation modeling; *b*: unstandardized regression coefficient; s.e.: standard error of the coefficient; *β*: standardized regression coefficient; all variables are latent factors with a mean of 0 and a standard deviation of 1.

Table S16

Results from the Predictive Analyses Conducted in the Main Study with the Bifactor-CFA Solution of Total Mediation

	Predictors											
	Autonomy			Relatedness			Competence			Global Need Satisfaction		
Outcomes	*B*	*s.e.*	*β*	*b*	*s.e.*	*β*	*b*	*s.e.*	*β*	*b*	*s.e.*	*β*
Positive Affect	-.070	.121	-.060	-.146	.093	-.101	.213	.097*	.150	.911	.145**	.733
Negative Affect	-.829	.310**	-.642	-.488	.191*	-.305	-.615	.235**	-.392	-.041	.119	-.030
Job Satisfaction	1.884	.671**	.644	-.080	.155	-.022	.049	.186	.014	1.697	.405**	.546
Citizenship Behaviors												
Altruism	-.085	.101	-.098	.122	.081	.112	-.012	.084	-.011	.361	.086**	.389
Helping	.072	.093	.085	.173	.070*	.164	-.057	.074	-.055	.192	.075**	.213
Sportsmanship	.691	.189**	.629	.238	.122	.174	.288	.129*	.216	.062	.095	.053
Civic Virtue	.176	.093	.200	.007	.086	.007	.023	.076	.022	.283	.078**	.302
Work Engagement												
Vigor	.265	.103**	.248	-.105	.075	-.079	.085	.079	.066	.616	.090**	.541
Dedication	.080	.136	.065	-.264	.114*	-.172	-.075	.109	-.050	.939	.185**	.712
Absorption	-.055	.126	-.052	-.212	.097*	-.163	-.106	.095	-.083	.688	.135**	.619
Burnout												
Physical Fatigue	-.687	.136**	-.609	-.185	.087*	-.132	-.068	.077	-.049	-.228	.076**	-.190
Cognitive Weariness	-.640	.177**	-.532	-.311	.105**	-.208	-.639	.155**	-.437	-.260	.079**	-.203
Emotional Exhaustion	-.380	.135**	-.321	-.821	.138**	-.559	-.299	.110**	-.208	-.292	.076**	-.232

	Perceived Organizational Support		
	B	*s.e.*	*β*
Autonomy	.736	.083**	.593
Relatedness	.015	.071	.015
Competence	-.211	.075**	-.207
Global Satisfaction	.604	.073**	.517

Note. * $p \leq .05$; ** $p \leq .01$; CFA: confirmatory factor analysis; *b*: unstandardized regression coefficient; s.e.: standard error of the coefficient; *β*: standardized regression coefficient; all variables are latent factors with a mean of 0 and a standard deviation of 1.

Table S17

Latent Correlations between the Variables in the Main Study in the Confirmatory Factor Analytic Model

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Age	--																	
2. Gender (1 male; 2 female)	*.010*	--																
3. Autonomy need satisfaction	*.053*	*.006*	--															
4. Relatedness need satisfaction	*-.018*	*.073*	.599	--														
5. Competence need satisfaction	*.090*	*-.039*	.582	.425	--													
6. Perceived org. support	-.112	*.001*	.646	.346	.258	--												
7. Negative affect	*.010*	*.076*	-.446	-.279	-.358	-.281	--											
8. Positive affect	*.007*	*.089*	.577	.433	.610	.345	-.108	--										
9. Job satisfaction	*.034*	*-.027*	.917	.460	.504	.666	-.387	.567	--									
10. Altruism	*-.045*	*.062*	.267	.377	.252	.172	*-.105*	.290	.190	--								
11. Helping behaviors	.157	*.029*	.279	.303	.123	.163	*-.068*	.244	.299	.506	--							
12. Sportsmanship	*.004*	.118	.363	.222	.293	.396	-.434	.397	.454	*.078*	*-.003*	--						
13. Civic virtue	*.022*	*-.005*	.317	.254	.285	.327	*-.014*	.480	.381	.270	.438	.166	--					
14. Vigor	*.078*	.106	.667	.354	.463	.411	-.257	.740	.695	.302	.338	.374	.488	--				
15. Dedication	*.007*	*.016*	.743	.378	.471	.386	-.278	.698	.795	.284	.300	.347	.488	.889	--			
16. Absorption	*.032*	*.034*	.554	.318	.376	.308	-.139	.607	.568	.339	.331	.259	.441	.787	.799	--		
17. Physical fatigue	*.044*	.094	-.583	-.302	-.261	-.445	.483	-.244	-.565	*-.073*	-.132	-.345	-.180	-.513	-.444	-.344	--	
18. Cognitive weariness	.104	*.022*	-.468	-.322	-.503	-.340	.483	-.348	-.437	-.130	*-.038*	-.337	-.165	-.370	-.369	-.275	.644	--
19. Emotional exhaustion	*.056*	*-.056*	-.400	-.616	-.337	-.270	.334	-.266	-.324	-.257	-.212	-.199	-.155	-.285	-.270	-.222	.397	.538

Note. Non-statistically significant correlations ($p > .05$) are marked in italics; all variables (with the exception of age and gender) are latent factors with a mean of 0 and a standard deviation of 1.

Table S18

Latent Correlations between the Variables in the Main Study in the Exploratory Structural Equation Modeling Solution

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Age	--																	
2. Gender (1 male; 2 female)	*.010*	--																
3. Autonomy need satisfaction	*.049*	-*.009*	--															
4. Relatedness need satisfaction	-*.058*	*.094*		--														
5. Competence need satisfaction	*.102*	-*.060*			--													
6. Perceived org. support	-.112	*.001*	.624	.160	*.053*	--												
7. Negative affect	*.010*	*.076*	-.345	-.162	-.237	-.281	--											
8. Positive affect	*.007*	*.089*	.374	.200	.504	.345	-.108	--										
9. Job satisfaction	*.034*	-*.027*	.874	.170	.230	.666	-.387	.567	--									
10. Altruism	-*.045*	*.062*	.148	.313	.158	.172	-*.105*	.290	.190	--								
11. Helping behaviors	.157	*.029*	.254	.268	-*.022*	.163	-*.068*	.244	.299	.506	--							
12. Sportsmanship	*.004*	.118	.293	*.100*	.204	.396	-.434	.397	.454	*.078*	-*.003*	--						
13. Civic virtue	*.022*	-*.005*	.240	.141	.197	.327	-*.014*	.480	.381	.270	.438	.166	--					
14. Vigor	*.078*	.106	.582	.148	.275	.411	-.257	.740	.695	.302	.338	.374	.488	--				
15. Dedication	*.007*	*.016*	.664	.129	.279	.386	-.278	.698	.795	.284	.300	.347	.488	.889	--			
16. Absorption	*.032*	*.034*	.469	.135	.239	.308	-.139	.607	.568	.339	.331	.259	.441	.787	.799	--		
17. Physical fatigue	*.044*	.094	-.553	-.154	-.086	-.445	.483	-.244	-.565	-*.073*	-.132	-.345	-.180	-.513	-.444	-.344	--	
18. Cognitive weariness	.104	*.022*	-.302	-.160	-.410	-.340	.483	-.348	-.437	-.130	-*.038*	-.337	-.165	-.370	-.369	-.275	.644	--
19. Emotional exhaustion	*.056*	-*.056*	-.207	-.567	-.177	-.270	.334	-.266	-.324	-.257	-.212	-.199	-.155	-.285	-.270	-.222	.397	.538

Note. Non-statistically significant correlations ($p > .05$) are marked in italics; all variables (with the exception of age and gender) are latent factors with a mean of 0 and a standard deviation of 1.

Table S19

Latent Correlations between the Variables in the Main Study in the Bifactor-Confirmatory Factor Analytic Model

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Age	--																		
2. Gender (1 male; 2 female)	*.010*	--																	
3. Autonomy need satisfaction	*.022*	*.099*	--																
4. Relatedness need satisfaction	*-.071*	*.119*		--															
5. Competence need satisfaction	*.078*	*-.004*			--														
6. Global need satisfaction	*.052*	*-.042*				--													
7. Perceived org. support	-.112	*.001*	.424	*.005*	-.108	.521	--												
8. Negative affect	*.010*	*.076*	*.395*	*.146*	*-.019*	-.536	-.281	--											
9. Positive affect	*.007*	*.089*	.287	.127	.355	.523	.345	-.108	--										
10. Job satisfaction	*.034*	*-.027*	.423	*-.084*	*-.042*	.814	.666	-.387	.567	--									
11. Altruism	*-.045*	*.062*	.582	.435	.229	.125	.172	*-.105*	.290	.190	--								
12. Helping behaviors	.157	*.029*	.519	.327	*.036*	.144	.163	*-.068*	.244	.299	.506	--							
13. Sportsmanship	*.004*	.118	*-.273*	*-.123*	*.018*	.433	.396	-.434	.397	.454	*.078*	*-.003*	--						
14. Civic virtue	*.022*	*-.005*	*.113*	*.071*	*.112*	.300	.327	*-.014*	.480	.381	.270	.438	.166	--					
15. Vigor	*.078*	.106	.314	*-.023*	*.105*	.587	.411	-.257	.740	.695	.302	.338	.374	.488	--				
16. Dedication	*.007*	*.016*	.356	*-.054*	*.055*	.657	.386	-.278	.698	.795	.284	.300	.347	.488	.889	--			
17. Absorption	*.032*	*.034*	.323	*.019*	*.086*	.478	.308	-.139	.607	.568	.339	.331	.259	.441	.787	.799	--		
18. Physical fatigue	*.044*	.094	*.219*	.190	.194	-.631	-.445	.483	-.244	-.565	*-.073*	-.132	-.345	-.180	-.513	-.444	-.344	--	
19. Cognitive weariness	.104	*.022*	.361	*.121*	-.192	-.560	-.340	.483	-.348	-.437	-.130	*-.038*	-.337	-.165	-.370	-.369	-.275	.644	--
20. Emotional exhaustion	*.056*	*-.056*	*-.199*	-.521	-.149	-.359	-.270	.334	-.266	-.324	-.257	-.212	-.199	-.155	-.285	-.270	-.222	.397	.538

Note. Non-statistically significant correlations ($p > .05$) are marked in italics; all variables (with the exception of age and gender) are latent factors with a mean of 0 and a standard deviation of 1.

Table S20

Latent Correlations between the Variables in the Main Study in the Bifactor-Exploratory Structural Equation Modeling Solution

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Age	--																		
2. Gender (1 male; 2 female)	*.010*	--																	
3. Autonomy need satisfaction	*-.034*	*-.045*	--																
4. Relatedness need satisfaction	-.118	*.066*	0	--															
5. Competence need satisfaction	*.023*	*-.096*	0	0	--														
6. Global need satisfaction	*.100*	*.041*	0	0	0	--													
7. Perceived org. support	-.112	*.001*	.409	*-.025*	-.091	.490	--												
8. Negative affect	*.010*	*.076*	-.521	-.266	-.331	-.193	-.281	--											
9. Positive affect	*.007*	*.089*	.133	*-.027*	.318	.563	.345	-.108	--										
10. Job satisfaction	*.034*	*-.027*	.768	*.000*	.130	.611	.666	-.387	.567	--									
11. Altruism	*-.045*	*.062*	-.158	*.066*	*-.053*	.416	.172	*-.105*	.290	.190	--								
12. Helping behaviors	.157	*.029*	.194	.148	*-.084*	.255	.163	*-.068*	.244	.299	.506	--							
13. Sportsmanship	*.004*	.118	.311	.132	.198	.231	.396	-.434	.397	.454	*.078*	*-.003*	--						
14. Civic virtue	*.022*	*-.005*	*.152*	*.043*	*.120*	.286	.327	*-.014*	.480	.380	.270	.438	.166	--					
15. Vigor	*.078*	.106	.597	*.039*	.245	.416	.411	-.257	.740	.695	.302	.338	.374	.488	--				
16. Dedication	*.007*	*.016*	.620	*-.024*	.214	.480	.386	-.278	.698	.795	.284	.300	.347	.488	.889	--			
17. Absorption	*.032*	*.034*	.382	*-.034*	.149	.408	.308	-.139	.607	.568	.339	.331	.259	.441	.787	.799	--		
18. Physical fatigue	*.044*	.094	-.677	-.166	-.143	-.271	-.445	.483	-.244	-.565	*-.073*	-.132	-.345	-.180	-.513	-.444	-.344	--	
19. Cognitive weariness	.104	*.022*	-.332	-.186	-.420	-.308	-.340	.483	-.348	-.437	-.130	*-.038*	-.337	-.165	-.370	-.369	-.275	.644	--
20. Emotional exhaustion	*.056*	*-.056*	*-.031*	-.423	*-.052*	-.464	-.270	.334	-.266	-.324	-.257	-.212	-.199	-.155	-.285	-.270	-.222	.397	.538

Note. Non-statistically significant correlations ($p > .05$) are marked in italics; all variables (with the exception of age and gender) are latent factors with a mean of 0 and a standard deviation of 1.