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RESEARCH ARTICLE

Verification of a Predictive Model of Psychological Health at Work in Canada and France

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The purpose of this study was to test the invariance of a predictive model of psychological health at work (PHW) in Canada and France. The model a) defines PHW as an integrative second-order variable (low distress, high well-being) and b) includes three categories of PHW inductors (job demands, personal resources and social-organizational resources) and one psychological intermediate variable (needs satisfaction) that were found to be directly or indirectly related to PHW in a previous study on a sample of French teachers (Boudrias, Desrumaux, Gaudreau, Nelson, Savoie and Brunet, 2011). To test if this model is invariant across countries, these data from French teachers (N = 391) were reanalyzed and compared with data from a sample of Canadian teachers (N = 480) who completed the same set of questionnaires. Results from structural equation modeling analyses indicated that the model is completely invariant across the two samples. Therefore, pathways to PHW appeared to generalize across these samples of teachers without the addition of other cultural variables. This PHW model suggests that personal resources exert considerable influence directly and indirectly on psychological health through multiple mediators. Research implications and study limitations are discussed.

Keywords: psychological health; personal resources; job demands; work climate; satisfaction of basic needs; invariance.

Verification of a Predictive Model of Psychological Health at Work in Canada and France

Psychological health problems at work are an important and costly issue in many countries. In Canada, it is estimated that mental health problems in general cost between 14 billion (Stephen & Joubert, 2001) and 33 billion Canadian dollars per year (Global Business and Economic Roundtable on Addiction and Mental Health, 2004). In Europe, the cost of depression alone is estimated at 118 billion Euros annually (Sobocki et al., 2006). According to insurance data, more than 75% of short- and long-term sick leaves among Canadian workers are due to psychological problems (Watson Wyatt, 2005). In Europe, stress at work would be responsible for 50% to 60% of sick days (Paoli & Merllié, 2000).

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Given these statistics, it is important to understand the factors that might prevent ill-health and promote positive psychological health in the workplace. To this effect, various predictive models have been developed to understand what contributes to good health at work, based on a list of many possible predictors (Danna & Griffin, 1999; Nelsons & Simmons, 2003; Warr, 1994). Conceptual models could help in this regard by specifying how to conceive the phenomenon under study (e.g., psychological health at work), its inductors, and the mechanisms by which they relate to health. Statistical modeling could then provide an estimate of how well the selected variables and specified paths fit the data in real samples. These modeling efforts provide both a simplified conception of the reality and a more accurate estimation of the relationships between variables, which can provide evidence-based knowledge to guide decision makers concerned with maintaining a psychologically healthy workforce. However, it is important to replicate findings for these models to determine their tenability in various contexts or the extent to which they are applicable for other persons in other places and at other times (Campbell, 1986; Uncles & Kwok, 2012). With this information, decision makers in various contexts and geographical regions can be more confident that these models are valid representations of reality on which they can rely to orient their interventions.

The goal of this study is to further test a predictive model of psychological health at work (Boudrias et al., 2011). More specifically, it aims at re-analyzing Boudrias et al. (2011) data to test the invariance of this predictive model in samples of teachers from two different French-speaking countries: France and Canada (province of Quebec). This study will indicate whether it is possible to generalize the model—which was initially tested in France (Boudrias et al., 2011)—to another sample of teachers from a culturally distinct environment. Conversely, the presence of variability in model fits and estimates would indicate that this predictive model cannot be used without some cultural adaptation to correctly understand the psychological health of Canadian teachers. Below, we outline the main characteristics of this predictive model in comparison with some models available in the literature.

Psychological Health at Work

Our model aimed at understanding the contributing factors to psychological health at work (PHW), which is defined as an integrated concept comprising both the presence of well-being indicators and the absence of distress indicators. This conceptualization is consistent with the World Health Organization's (WHO, 1946) definition of health (e.g., a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity) and with empirical evidence suggesting that psychological health can be represented as a higher-order construct of positive and negative indicators of self-regard (e.g., self-esteem, happiness vs. self-depreciation, anxiety), social adjustment (e.g., sociability vs. irritability/aggression) and activity involvement (involvement vs. disengagement; Massé, Poulin, Dassa, Lambert, Bélair, & Battaglini, 1998). Furthermore, we refer to psychological health *at work*, because work is the context in which we are interested and is therefore the context in which the measures of well-being and distress are anchored (Gilbert, Dagenais-Desmarais & Savoie, 2011).

Our integrated approach differs from models and studies that consider each type of symptoms separately or in isolation. More specifically, it appears that many models were developed for the purposes of understanding and predicting negative health symptoms, such as stress, distress, and burnout (e.g., Job-Demand Control—Karasek, 1979; Effort-Reward Imbalance—Seigrist, 1996; Strain, coping and burnout models—Lazarus & Folkman, 1984; Lee & Ashforth, 1993). This approach has its limitations because the outcome variable to be predicted focus only on deficiency (e.g., ill-health indicators) rather than on a complete assessment of PHW (lack of distress, presence of well-being). Then, there is no guarantee that factors protecting from ill-health will also contribute to the full promotion of PHW (Nelson & Simmons, 2003). This reality is increasingly recognized, as evidenced, for example, by the fact that models of burnout—defined as exhaustion, cynicism, and lack of efficacy—have been complemented in the last decade by models of work engagement—defined as vigor, absorption, and dedication (Schaufeli & Baker, 2004; Schaufeli, Salanova, Gonzalez-Roma & Bakker, 2002). The Job-Demand Resources Model embraces this more comprehensive approach, while keeping positive and negative symptoms separate based on different underlying processes (Bakker, Demerouti & Schaufeli, 2003). Interestingly, empirical studies relative to this conceptual model have been done on clarifying the multifaceted nature of PHW as well as pathways to its different indicators (Bakker, Demerouti, de Boer & Schaufeli, 2003; Bakker et al., 2003; Gonzalez-Roma, Schaufeli, Bakker & Lloret, 2006; Langelaan, Bakker, Schaufeli & Van Doornen, 2006) However, in many empirical studies, researchers continue to rely on a single negative health symptom, such as emotional exhaustion, because highly consistent results are found in predicting this variable (Lee & Ashforth, 1996; Maslash, Schaufeli & Leiter, 2001). All these factors may explain why articles examining negative psychological states outnumber the ones examining positive psychological states by a ratio of 17:1 (Diener, Suh, Lucas & Smith, 1999).

In this context, a more balanced view of psychological health at work was favored as the criterion variable to predict. This choice was motivated by the fact that there is a growing consensus that PHW is a multifaceted construct composed of positive and negative indicators (Barbier, Peters & Hansez, 2009). On the other hand, there is also evidence that PHW could be parsimoniously studied as a higher-order construct (Massé et al., 1998). While not being the exact opposites, past studies have shown that well-being and distress indicators from Massé et al. instruments are sufficiently correlated (-.66 to -.83; Boudrias et al., 2011; Forest et al., 2011; Rousseau et al., 2009) to be studied as a composite index (Brien, Hass & Savoie, 2011). Further, based on a three-sample study, Gonzalez-Roma et al. (2006) found that two pairs of engagement and burnout dimensions (e.g., vigor – exhaustion; dedication – cynicism) can be conceptualize as different facets of a same underlying continuum, rather than completely different dimensions. Based on these results, it seems reasonable to measure the full spectrum of PHW indicators and to integrate them in a higher-order construct of PHW. This approach offers the advantage of being parsimonious for structural equation modeling purpose and simpler to use for practitioner. Because there is a unified target (rather than two), it is easier for decision-makers to appreciate the influences of different inductors on PHW and to further capitalize on relevant managerial levers that can influence the most PHW (Mihalopoulos, Carter, Pirkis, & Vos, 2013).

Modeling the Contributions of Various Predictors

According to different theoretical models, at least three categories of predictors appear to be essential for explaining PHW: job demands, job resources, and personal resources (de Jonge & Dorman, 2003; Houkes et al., 2003, 2008; Lent, 2004; van den Heuvel, Demerouti, Bakker, & Schaufeli, 2010; Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007). However, few attempts have been made to integrate key factors associated with each category simultaneously in a single predictive model that could be tested empirically. Therefore, the ways these factors are interrelated, as well as the mechanisms leading to PHW, have rarely been tested in an integrated fashion even if modeling efforts

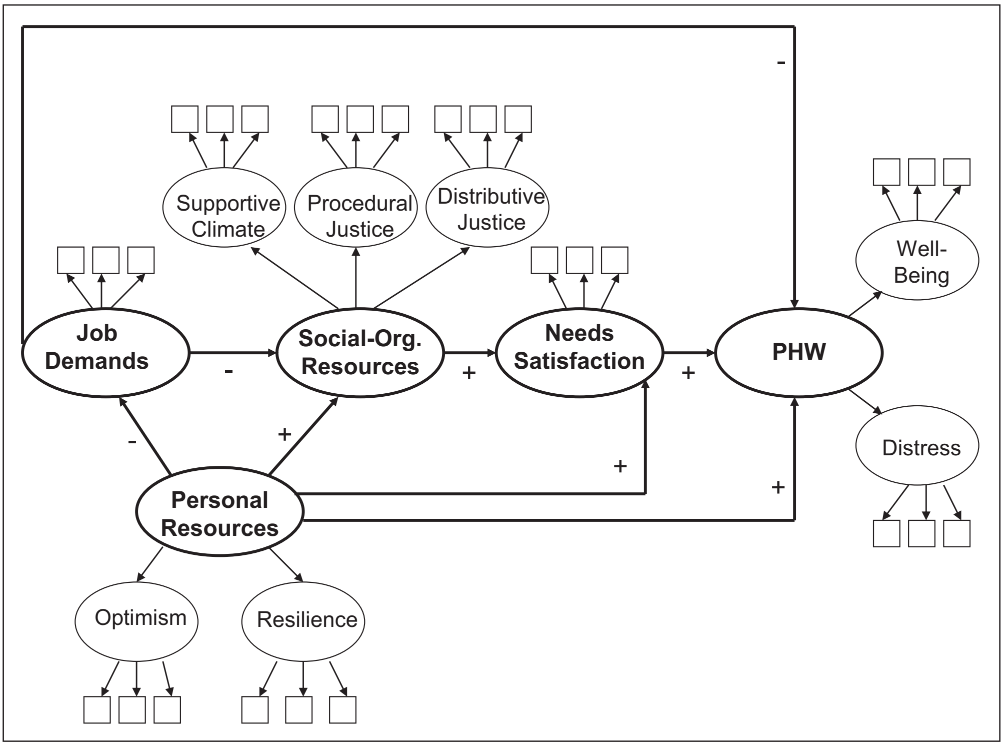

Figure 1: Predictive model of psychological health at work (PHW)

have been made at the conceptual level (Lent, 2004; van den Heuvel et al., 2010).

The predictive model of PHW, which is illustrated in **Figure 1**, incorporates key components from different, yet complementary, research perspectives. First, this model is compatible with self-determination theory (Deci & Ryan, 2000), which suggests that the satisfaction of basic needs (e.g., competence, autonomy, and relatedness) is a mediating variable linking the influences of both the work environment (e.g., supportive climate) and personal resources on PHW. Empirical research has largely substantiated that autonomy support is a strong predictor of needs satisfaction and a pivotal mediator in the relationship between a supportive climate and psychological health indicators, such as adjustment (Baard et al., 2004), involvement (Gagné, 2003; Deci et al., 2001), anxiety, self-esteem (Deci et al., 2001), and well-being (Lynch, Plant, & Ryan, 2005). Autonomy support or supportive climate is defined in these studies as a supportive managerial orientation perceived by employees (Deci et al., 2001). Studies relying on different operationalization of supportive climate (e.g. autonomy support, job resources, supportive climate and justice) have shown that needs satisfaction fully mediate or explain the relationship between job or social-organizational resources and psychological health (Gagné, 2003; Gilbert, Savoie & Brunet, 2008; Van den Broeck, Vansteenkiste, De Witte, & Lens, 2008). However, conclusions from these studies remain limited because they rarely include in their model the two other key predictors of PHW, namely job demands and personal resources.

The Demand-Resource Model considers job demands and job resources, but it minimized the role of personal resources in its early formulations (Bakker et al., 2003). However, the role played by personal resources (described in details further down) is now well recognized as they positively contribute to the dynamic of perceiving and creating more job resources (Llorens, Schaufeli, Bakker, & Salanova, 2007; Xanthopoulou, Bakker, Demerouti,& Schaufeli, 2009ab) and diminishing the perception of job demands or their cost (Meier, Semmer, Elfering, & Jacobshagen, 2008; Xanthopoulou et al., 2007).

Job demands refer to aspects of the work context that tax the personal capacities of employees. While job resources have been theorized to influence PHW indirectly through a motivation process (e.g., needs satisfaction), job demands are thought to influence PHW more directly through a reduction of employees' energy (Van den Broeck et al., 2008). Studies based on the Demand-Resource Model tend to confirm the direct relationship between job demands and psychological health symptoms (Bakker et al., 2003; Bakker Demerouti, & Verbeke, 2004; Hakanen, Wilmar, & Ahola, 2008; Xanthopoulou et al., 2007). Nevertheless, job demands could influence PHW indirectly as well. For instance, the reduction of energy triggered by job demands could result in individuals being less equipped mentally to perceive job resources. Some studies support the notion that individuals reporting higher workloads tend to perceive less job resource availability (Bakker et al., 2003; Llorens et al., 2007; Xanthopoulou et al., 2007) and less organizational support and justice (Wilson et al., 2004). Organizational justice, as well as supportive climate, refers to the perception of being treated fairly by organizational agents (Boudrias, Brunet, Morin, Savoie, Plunier, & Cacciatore, 2010; Greenberg & Colquitt, 2005). Therefore, job overload may be interpreted as a representative indication of the organization's employee-management style (Lawler & Yoon, 1996), which is likely to diminish the likelihood that individuals will subsequently seek support from the organization because they have low expectations of finding it.

According to Demand-Resource Model, resources represent aspects of a job context that are functional in achieving job goals, coping with demands, and stimulating personal growth (Bakker & Demerouti, 2007). Based on studies of teachers, which is the population targeted by this study, it appears that the most beneficial resources for teachers' psychological health are social and organizational in nature (Bakker et al., 2007; Jackson, Rothmann, & van de Vijver, 2006; Lapointe, Do Than, Savoie, & Brunet, in press; Hakanen, Bakker, & Schaufeli, 2006). Indeed, supportive climate (e.g. autonomy support, management consideration, and opportunities for development) and organizational justice (e.g. clear and transparent rules and fair allocation of resources and rewards) represent important job resources for teachers to thrive at work. Therefore, we refer to these as social-organizational resources that both represent contextual resources presumed to subsequently influence satisfaction of needs (Gagné & Forest, 2008) and PHW (Elovaino, Kivimaki, & Helkama, 2001; Francis & Barling, 2005). Indeed, the socio-organizational resources offer guidelines and contextual information to sustain competent and autonomous actions among individuals (e.g., via transparent rules, autonomy support, opportunity for development), while providing individuals with a sense of belonging to the organization derived from management's consideration and fair treatment. The satisfaction of the basic needs, in return, has been found to fully mediate the influence of contextual resources on PHW (Gagné, 2003; Gilbert et al., 2008; Van den Broeck et al., 2008).

Personal resources should also be taken into consideration if one wants to have a complete picture of the factors that can have a positive impact on PHW. The psychological adjustment model proposed by Lent (2004) indeed suggests that personal dispositions strongly influence the appraisal of demands and environmental supports, coping efforts, as well as psychological health itself. Personal resources refer to psychological capacities that serve as anchor stones which allow individuals to adapt more easily to changing and demanding life circumstances (Hobfoll, 2002). According to the “Personal Resource Adaptation Model” (van den Heuvel et al., 2010), optimism and resilience are personal resources that can play an important role in reducing distress at work. Resilience can be defined as the psychological capacity to “bounce back” from adversity (Tugade & Frederickson, 2004) rooted in a high sense of self-efficacy and a tendency to appraise stressful events as a challenge rather than a threat (Maddi, 2004). Optimism can be described more broadly as a generalized expectation of positive experiences and outcomes throughout one’s life (Scheier, Carver & Bridge, 1994). These two resources, beside self-efficacy and hope, can be reinterpreted as indicators of a higher-order concept of psychological capital (Avey et al., 2009), likely to influence PHW in at least four distinct ways. First, optimistic and resilient individuals are more likely to perceive job demands as challenging rather than threatening (Scheier et al., 1994). This reinterpretation of the situation could even diminish the perceived amount of job demands (primary appraisal), which are known to be negatively related to psychological health (Lazarus & Folkman, 1984). Second, based on a dynamic spiral of resources gain (Hofboll, 2002), personal resources, such as positive self-beliefs, are related to the creation or perception of more contextual resources at work (Badri, Mohaidat, Ferrandino, El Mourad, 2013; Llorens et al., 2007). Indeed, people who possess more personal resources are better equipped to interact confidently and positively with others and therefore access the socio-organizational resources to thrive in their organization. Third, optimistic and resilient individuals could behave in manners that positively influence their personal day-to-day conditions, and thereby be the architect of their own needs satisfaction by adopting active coping strategies, such as problem solving, coping, and job crafting (Scheier, Carver, & Bridge, 2001; Tims, Bakker & Derks, 2012; Wrzesniewski & Dutton, 2001). Finally, a fourth way in which the link between personal resources and PHW can be conceptualized is that positive and resourceful people are happier even in difficult circumstances because they can draw on a larger, boundless reservoir of psychological strengths and abilities (Diener et al., 1999; Langelaan et al., 2006; Scheier et al., 2001). We thus expect to find a direct relationship between personal resources and PHW.

Empirical Test of the Model in a French Sample of Teachers

The predictive model of PHW was tested in a cross-sectional study with a sample of 391 teachers in France (Boudrias et al., 2011; this sample is further described in the methodology). Results from structural equation analyses indicated that the model fit the data well (CFI, TLI = .96; RMSEA = .049; SRMR = .058) and that 86% of the variance of PHW could be explained by the predictors that were retained. The results showed that personal resources exert the strongest direct influence on PHW. As predicted, job demands had a direct negative effect on PHW, and the influence of social-organizational resources on PHW was fully mediated by the satisfaction of basic needs. Moreover, examination of the indirect effects implied in the model mostly supports the chain of intervening variables linking personal resources to PHW. Finally, this model appears to fit the data better than alternative models, and no significant interaction between the categories of predictors was found in the prediction of PHW.

The Present Study

The purpose of this study was to test the model invariance across samples from two different countries: France and Canada (province of Quebec). These two countries were selected for linguistic reasons, as the questionnaires measuring all the variables in the model were available in French only. The Canadian sample was composed of teachers to make sure the results were comparable with the French sample, in terms of job type. However, the teachers in these samples work in different administrative systems and in different national cultures. For instance, school levels are not divided in quite the same way in both countries (e.g., student age ranges per level differ), teachers do not have exactly the same initial university training (e.g., 4 years in Quebec vs. 5 years in France for teaching at the primary level), and teachers' incomes are slightly higher in Quebec (between US$35,407$ and US$68,300; mean of US$48,300$; Emploi-Quebec, 2010) than in France (between US$27,296$ and US$51,833 for secondary level; OECD, 2010).

With respect to national culture, France and the province of Quebec can be compared using Hofstede's cultural values framework (Hofstede, Hofstede & Minkov, 2010). Based on this framework, both French and Quebec cultures place similar value on individualism (France = 71, Quebec =73) and caring for others, as expressed in a low score on the masculinity/femininity scale (France = 43, Quebec = 45). However, compared with Quebec, the national culture in France is characterized by a higher acceptance of status inequality (power distance = 68 vs. 54) and a lower tolerance for uncertainty and ambiguity (uncertainty avoidance = 86 vs. 60). This considerable difference in uncertainty avoidance is interesting because this cultural dimension has a major effect on subjective well-being at a national level (Arrindell et al., 1997). Therefore, this study will indicate whether estimates associated with the predictive model of PHW are invariant across national cultures characterized by different attitudes toward uncertainty and status inequality.

Method

Participants and Procedure

Two samples of teachers were recruited to participate in this France-Canada comparative study. All participants, who completed the same set of paper-and-pencil questionnaires, were informed of the purpose of the study (e.g., investigating the quality of teachers' work life) and consented to participate. They were also reassured that all their responses would be kept confidential and anonymous.

In France, teachers from schools in the Nord-Pas de Calais region were approached individually in 2008–2009 by research assistants to form a convenience sample. Participants were recruited at their workplace with the authorization of their school's administration. They were instructed to complete the questionnaires on their personal time within two weeks and return them to the research assistants. The characteristics of the 391 teachers who completed the questionnaire are presented in **Table 1**. At the time of this study, the teachers were employed by 57 different educational institutions, with a mean of 6.7 individuals per institution (*SD* = 5.8). Participants taught at the primary (33%), collège (33%) or lycée/university (29%) level or at multiple levels (5%).

In Canada, teachers were recruited in the province of Quebec in collaboration with their school boards in 2009–2010. School boards were invited to take part in a study where the psychological health of their primary and secondary school teachers would be assessed. Thereafter, the school boards proposed to their school principals that they participate in the project. If a school principal was interested in taking part, researchers went to school on a paid pedagogical day and administered the questionnaire to the teachers who volunteered. Teachers from 26 schools participated, with a mean of 18.0 individuals per institution (*SD* = 20.8). The characteristics of the 480 teachers who completed the questionnaire are presented in Table 1. Participants taught in elementary (40%), high (56%) and vocational training schools (4%).

Statistical tests were conducted to compare the two samples with respect to their sociodemographic characteristics. The results indicated that there were no differences ($p <$ .01) between the samples in terms of gender, age or teaching level. However, the samples appear to differ in regard to job status (χ^2 =

	France	Quebec, Canada
Gender		
Female	61%	69%
Male	39%	31%
Age		
Less than 30	18%	18%
31-40	33%	32%
41-50	27%	33%
51and above	22%	17%
Teaching level		
Primary	32%	40%
Secondary and above	68%	60%
Job status		
Permanent / full time	66%	77%
Contract / full-time	27%	15%
Contract / part-time	7%	8%
Teaching experience (years)	16.75 (SD = 11.31)	13.77 (SD = 8.87)

Table 1: Composition of French and Canadian samples

18.9, $p < .001$) and teaching experience ($t = 4.32$, $p < .001$). As such, there are more non-permanent teachers as well as more experienced teachers in the French sample than in the Canadian one. These differences may reflect more precarious work conditions for younger workers in France in general (e.g., contract work is more common and lasts longer) than in Canada.

Measures

The same set of questionnaires was administered to both samples. Each questionnaire had been previously validated with French-Canadian respondents (factor structures and convergent/criterion validities; references to validation studies are provided below) and appeared to provide reliable measures of variables in the two samples, as indicated below.

Psychological health at work. Positive and negative indicators of psychological health were assessed using Massé et al.'s (1998) instrument items validated to be anchored in the work context (Gilbert et al., 2011). A 24-item scale measured well-being as indexed by work engagement, harmonious relationships, and personal happiness (e.g., "I have goals and ambitions," "I get along well with my colleagues," "I feel healthy and in good shape"). A 21-item scale was used to assess distress as indexed by anxiety/depression, irritability/aggression, and work disengagement (e.g., "I feel depressed or 'down in the dumps'," "I am aggressive about everything and nothing," "I feel like throwing everything to the wind, quitting"). Participants were asked to indicate the extent (1 = *almost never* to 5 = *almost always*) to which they had experienced symptoms in the previous month at work. Internal consistency of well-being ($\alpha_{France} = .91$; $\alpha_{Canada} = .92$) and distress ($\alpha_{France} = .95$, $\alpha_{Canada} = .95$) scales were satisfactory in the present study.

Satisfaction of basic needs. A nine-item scale was used to measure satisfaction of the need for autonomy (e.g., "I can use my judgment to solve problems in my job"), competence (e.g., "I feel competent in my job"), and affiliation ("I feel understood by others in my workplace"). Each item was rated on a 6-point scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). This scale had been previously validated with French and Canadian samples (Brien et al., 2012) and appeared to provide a reliable score of needs satisfaction in this study (α_{France} = .83; α_{Canada} = .84).

Personal resources: optimism and resilience. We evaluated optimism with six items from Scheier et al.'s (1994) Life Orientation Test—Revised (e.g., "Overall, I expect more good things to happen to me than bad"). Each item was rated on a 6-point scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). This scale had been previously validated in French by Trottier, Mageau, Trudel & Halliwell (2008) and proved to be reliable in the present study (α_{France} = .79; α_{Canada} = .77).

Resilience was measured with nine items from Brien, Brunet, Boudrias, Savoie and Desrumaux's (2008) questionnaire. This instrument assesses how individuals react "when they face a great difficulty (stress, adversity)." Participants indicated how often each of the statements applied, using a 5-point scale (1 = *almost never* to 5 = *almost always*). Resilience was indexed as a tendency to see challenges positively, to perceive being in control, and to grow from adversity (e.g., "see benefits that the resolution of this difficulty can bring me," "feel able to influence the course of events," "rebound with more competencies"). This scale displayed very good internal consistency coefficients in this study (α_{France} = .88; α_{Canada} = .89).

Social-organizational resources: climate and justice. Supportive climate was measured with nine items from Roy's (1989) work climate questionnaire. Participants rated on a 6-point scale (1 = *strongly disagree* to 6 = *strongly agree*) the extent to which they perceive being provided with autonomy, consideration, and development opportunities in their organization (e.g., "You are free to use your skills as you see fit," "Your contribution is recognized in the organization," "You are given the opportunity to develop yourself"). Very good internal consistency indices were obtained for the climate scale in the present study (α_{France} = .90; α_{Canada} = .91).

Organizational justice was measured with two instruments. Procedural justice was assessed with nine items, adapted from Moorman's (1991) questionnaire, which evaluated whether employees perceive the decision-making processes as fair and transparent (e.g., "All parties affected by the decisions are represented when decisions are made"). Distributive justice was measured using Price and Muller's (1986) six-item questionnaire. These items assessed whether employees are rewarded on the basis of individual merit, efforts, responsibilities, etc. (e.g., "The rewards offered to employees are awarded according to each person's responsibilities"). For both questionnaires, participants rated on a 6-point scale (1 = *strongly disagree* to 6 = *strongly agree*) the extent to which they perceive being treated fairly. Internal consistency of procedural (α_{France} = .94; α_{Canada} = .93) and distributive justice (α_{France} = .87; α_{Canada} = .83) scales were satisfactory in the present study.

Job demands. We measured job demands with nine items covering various work characteristics, such as workload, emotional demands, physical demands, task complexity, task diversity, challenges to be met, responsibilities to be assumed, pressure to perform, and demands from management. The instrument indicates the extent to which demands were perceived as exceeding an individual's capacities (1 = *not at all*; 3 = *very much*). This instrument had been used successfully to measure job demands in a previous sample of teachers (Lapointe, Boudrias, Brien, & Savoie, 2009) and proved to be reliable in the present study (α_{France} = .83; α_{Canada} = .86).

Analytical Strategy

Structural equation models were fitted with Mplus 6.12, using the maximum likelihood robust estimation. To compare our results with those obtained in France, we used the same analytical strategy as Boudrias et al. (2011). We created three manifest indicators (parcels) per latent variable, for a total of 27 indicators for the nine latent variables (Bandalos, 2002; Hagvet, & Nasser, 2004). These indicators were designed to represent all facets/dimensions of the latent variables in each parcel in the case of multidimensional scales (e.g., supportive climate, resilience, needs satisfaction, well-being and distress; see Kishton & Widaman, 1994 for an example of this procedure). The alpha-if-deleted method was used to distribute items in parcels in the case of one-dimensional scales (e.g., item with the highest item-total correlation was assign to the first parcel, the second highest to the second parcel, and so on; see Bishop, Scott, Goldsby, & Cropanzano, 2005 for an example of this procedure). Model fit was globally assessed using the following fit indices: the χ^2 likelihood ratio test, the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Standardized Root Mean Square Residual (SRMR) and the Root Mean Square Error of Approximation (RMSEA). Values above .95 for the CFI and TLI, lower than .08 for the SRMR, and lower than .06 for the RMSEA suggest a relatively good fit (Bollen, 1989; Hu & Bentler, 1999).

Overview of Invariance Analyses in the French and Canadian Samples

A two-step approach was used to estimate the goodness of fit of the measurement model first and then of the structural model (Millsap, 2011). We began by testing a baseline measurement model in which the same pattern of fixed and freed loadings was specified across the two samples (i.e., configural invariance). Then, a series of hierarchically nested measurement models was tested by progressively adding equality constraints on the loadings, the error terms, and the covariance between the second-order latent variables. The model with invariant covariances was deemed useful in determining whether some of the error-free correlations between the latent variables could differ across the two samples. The covariances between the latent variables were subsequently replaced by pre-specified unidirectional paths in the structural models (see Figure 1). We began by testing a baseline structural model (incorporating all the equality constraints from the measurement model) in which the paths were freely estimated separately in both samples. These paths were constrained to equality across samples in a subsequent model.

Nested models were compared using a series of fit indices to help us determine whether the null hypothesis of invariance should be rejected or retained. Differences in robust chi-square statistics (calculated using an online spreadsheet available at http://www.uoguelph.ca/~scolwell/difftest.html) should be interpreted with extreme caution because they tend to inflate the likelihood that the null hypothesis of invariance will be rejected (i.e., Type II error). However, the guideline initially proposed by Cheung and Rensvold (2002) to evaluate differences in CFI values (ΔCFI $\geq$ .010) was found to be too liberal (Meade, Jackson, & Braddy, 2008), failing to reject the null hypothesis even in the presence of meaningful forms of non-invariance across samples (i.e., Type I error).Therefore, as suggested by these researchers, a more conservative change in CFI values (ΔCFI $\geq$ .002) was used instead, as justification for rejecting the null hypothesis of invariance. Additionally, Marsh (2007) noted that the RMSEA and TLI can be used as evidence for the tenability of equality constraints when these fit indices are as good as or better than the model without the equality constraints. These fit indices were used as guidelines to evaluate the overall tenability of the different equality constraints added to the models.

All the measurement and structural models were tested using the maximum likelihood robust estimator. A final model was created and tested with the maximum likelihood estimator for the purpose of estimating the significance of the mediation effects in the model using the biased corrected bootstrapped 95% confidence intervals. Through this procedure, we estimated the total, direct, total indirect and specific indirect effects in this model. We also verified whether chains of intervening variables acted as significant mediators using the VIA command in Mplus.

	M_F	SD_F	M_{QC}	SD_{QC}	1	2	3	4	5	6	7	8	9
1. Supportive climate	4.25	.93	4.33	.86	--	.70	.35	-.49	.40	.35	.60	.47	-.52
2. Procedural justice	3.90	1.07	3.88	.97	.57	--	.32	-.41	.38	.31	.51	.41	-.47
3. Distributive justice	3.24	1.11	3.10	1.04	.47	.40	--	-.26	.09	.18	.19	.15	-.15
4. Job demands	1.51	.44	1.58	.45	-.34	-.10	-.18	--	-.24	.32	-.29	-.42	.45
5. Optimism	4.19	.90	4.71	.73	.31	.10	.12	-.31	--	.68	.58	.73	-.62
6. Resilience	3.50	.64	3.63	.64	.24	.10	.17	-.16	.65	--	.44	.69	-.54
7. Needs satisfaction	4.77	.62	4.92	.59	.63	.49	.32	-.21	.45	.38	--	.68	-.60
8. Well-Being	3.82	.51	3.95	.53	.43	.20	.19	-.43	.74	.65	.60	--	-.76
9. Distress	1.69	.64	1.76	.64	-.40	-.19	-.18	.42	-.54	-.38	-.46	-.71	--

Note. F = France, QC = Quebec, Canada; Latent correlations below diagonal are based on France data and correlations above the diagonal are based on Quebec, Canada data ($r > |.12|$ are significant at .05).

Table 2: Descriptive Statistics and Correlations between Study Latent Variables

Factor	Quebec κ	France κ	d
F1-Supportive climate	0	-0.069	-.0848
F2-Procedural justice	0	0.034	.0333
F3-Distributive justice	0	0.118	.1067
F4-Job demands	0	-0.082*	-.1768
F5-Optimism	0	-0.530**	-.6986
F6-Resilience	0	-0.148**	-.2327
F7-Needs satisfaction	0	-0.148**	-.2534
F8-Well-being	0	-0.147**	-.2742
F9-Distress	0	-0.053	-.0949

Note. ** $p < .01$. * $p < .01$. Latent mean of Quebec fixed at 0; Latent mean of France freely estimated. A significant latent mean in the France sample denotes a significant between-group difference.

Table 3: Latent Means Differences (κ) and Effect Size (d) across Quebec and France

Results

Preliminary analyses

Table 2 presents the observed means, standard deviations of the nine primary scales, as well as the correlations between the study latent variables freely estimated in the baseline measurement model in the France sample and in the Quebec, Canada sample. To compare between-group means, we performed latent means differences after establishing that factor loadings, error terms, and intercepts could be assume invariant across samples (e.g. measurement equivalence) and computed effect sizes for each latent variable in the measurement model. These analyses, displayed in **Table 3**, indicate that the

France sample has a significantly lower level of job demands, optimism, resilience, needs satisfaction, and well-being than the Quebec sample. Although these results indicate that the level of some variables does significantly vary across the two samples, they should not be interpreted as providing support for the moderating role of "culture" in the relationships between these variables or as an indication of the non-invariance of the predictive paths in the model.

Invariance Tests

As shown in **Table 4**, the baseline measurement model (configural invariance) fit the data well across the French and Canadian samples. Despite the statistical significance of the chi-square, all other indices suggest that the model fit the data very well (CFI, TLI > .95; SRMR < .08 and RMSEA <.06). Adding equality constraints across the samples did not reduce the CFI by more than .002 in each model comparison. Moreover, the TLI and the RMSEA 90% confidence interval remained exactly the same across the models tested. We can thus conclude that the measurement of latent variables was invariant across the countries. A "strong" measurement invariance was demonstrated by the fact that the nine-latent-variable configuration, each indicator loading, each indicator uniqueness and the covariance between latent variables can be assumed to be equal across the two samples. The measurement invariance was a pre-requisite to testing whether directional paths in the predictive model varied across the countries.

Equality constraints were then added into the structural model to determine whether the paths were invariant between the two samples. All indices suggest that the predictive model was invariant across the two samples (no significant change in the CFI, TLI, RMSEA or chi-square). Standardized estimates obtained in the two samples are displayed in **Figure 2**. Therefore, we can conclude that the directional paths are of similar magnitude in the two samples.

Model	χ^2	***df***	**CFI**	**TLI**	**SRMR**	**RMSEA**	**RMSEA 90 CI**	**Contrast**	Δdf	χ^2	**ΔCFI**
Measurement											
1. Configural	1170.46**	618	.967	.963	.056	.045	.041 - .049	---	---	---	---
2. Loadings	1205.86**	638	.966	.963	.062	.045	.041 - .049	2 vs. 1	20	35.47*	< -.002
3. Uniqueness	1254.01**	665	.965	.963	.064	.045	.041 - .049	3 vs. 2	27	48.87**	< -.002
4. Covariance	1272.76**	675	.965	.963	.071	.045	.041 - .049	4 vs. 3	10	18.79*	< -.002
Structural											
5. Configural	1261.04**	669	.965	.963	.065	.045	.041 - .049	---	---	---	---
6. Paths	1273.12**	677	.965	.963	.071	.045	.041 - .049	6 vs.5	8	7.79	< -.002

Table 4: Tests of Invariance across the French and Canadian samples

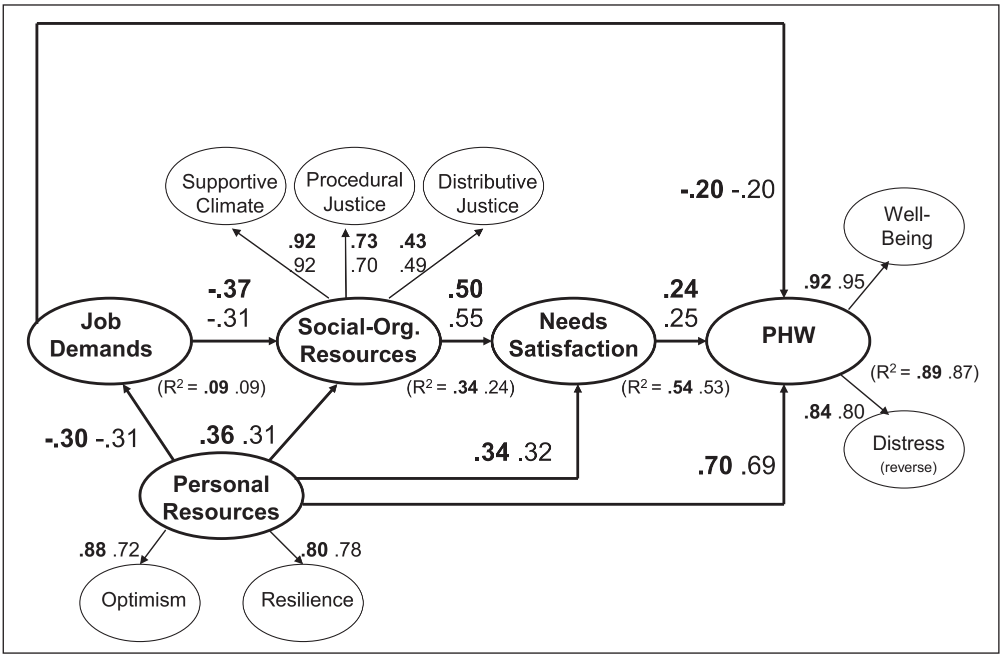

Figure 2: Standardized estimates associated with the predictive model of PHW in the Canadian (bold characters) and France (non-bold) samples. All parameters displayed in this figure are statistically significant (p<.01) and can be assumed to be invariant across samples.

Indirect effects

Table 5 presents the decomposition of effects in the model and allows us to verify the statistical significance of the mediation or indirect effects across the two samples combined. Indirect effects are provided for the total indirect effect (e.g., combination of all mediated paths specified between two variables) and for the specific indirect effects which assess each specific mediators implied in the theoretical model.

As in Boudrias et al. (2011), a significant indirect effect was found for a chain of multiple mediators between personal resources and psychological health: higher personal resources → lower perceived demands → higher perceived supportive environment → higher satisfaction of needs → higher PHW. Almost all significant indirect effects found were consistent with this sequence of intervening variables. Some minor differences, possibly due to a higher statistical power, were found in comparison with Boudrias et al.'s (2011) estimates. In the present study, we found that the following specific indirect effects were statistically significant, contrary to the findings in Boudrias et al.'s study: (a) personal resources → needs satisfaction → PHW and (b) social resources → needs satisfaction → PHW.

These analyses also revealed that: (a) personal resources had the strongest effect on PHW (.825), both directly (.645) and indirectly (.180), (b) the effect of job demands on PHW was mostly direct (-.201), (c) the effect of social-organizational resources on PHW was mainly indirect (.094), and (d) the chain of mediators based on the three categories of PHW inductors resulted in important indirect effects (.242, -252) in the prediction of needs satisfaction.

Discussion

The goal of this study was to test whether a predictive model of psychological health at work (PHW) could generalize from French teachers to Canadian ones. The results provide evidence of external validity of the

Effect	Total	95% CI	Direct	95% CI	Indirect total	95% CI	Indirect specific	95% CI
Personal resources → needs satisfaction	.626**	[0.521,0 .725]	.384**	[0.285, 0.484]	.242**	[0.176, 0.328]		
Job demands							-.041**	[-0.081, -0.012]
Social resources							.212**	[0.146, 0.293]
Job demands → social resources							.072**	[0.043, 0.114]
Demands → needs satisfaction	-.107*	[-0.218, -0.004]	.145**	[0.041, 0.256]	-.252**	[-0.350, -0.168]		
Social resources							-.252**	[-0.350, -0.168]
Personal resources → PHW	.825**	[0.735,0 .910]	.645*	[0.540, 0.751]	.180**	[0.139, 0.222]		
Job demands							.058**	[0.037, 0.085]
Social resources							-.006	[-0.043, 0.023]
Needs satisfaction							.080**	[0.050, 0.113]
Social resources → needs satisfaction							.040**	[0.023, 0.075]
Job demands → social resources							-.002	[-0.012, 0.009]
Job demands → need satisfaction							-.009**	[-0.018, -0.003]
Job demands → social resources → needs satisf							.015**	[0.008, 0.024]
Job demands → PHW	-.217**	[-0.288, -0.137]	-.201**	[-0.275, -0.118]	-.016	[-0.055, 0.021]		
Social resources							.007	[-0.032, 0.045]
Needs satisfaction							.030**	[0.008, 0.059]
Social resources → needs satisfaction							-.052**	[-0.087, -0.026]
Social resources → PHW	.082**	[0.025, 0.139]	-.012	[-0.086, 0.055]	.094**	[0.047, 0.146]		
Needs satisfaction							.094**	[0.047, 0.146]
Personal resources → social resources	.625**	[0.479, 0.786]	.467**	[0.312, 0.604]	.158**	[0.103, 0.242]		
Job demands							.158**	[0.103, 0.242]

Note. ** $p < .01$ * $p < .05$. PHW = psychological health at work.

Table 5: 95% Confidence Intervals of the Bootstrapped Indirect Effects with 500 bootstrapped samples

model, as the estimates were found to be fully invariant across samples of teachers in these two countries. This finding indicates that the predictive model, initially validated in France, holds for Canadian teachers evolving in a different administrative system and national culture. Differences in macro conditions were usually slightly in favor of Canadian workers as far as PHW is concerned (e.g., higher wages, less precarious job status, more egalitarian culture, and higher acceptance of uncertainty in society). Despite these differences, no significant difference was found in the pathways leading to better psychological health at work for teachers in these two countries.

Therefore, key features of this model can provide decision makers in both countries with a better understanding of PHW and of the ways in which it can be influenced positively or negatively by various factors. This model helps to understand the pathways to PHW, conceived as an integrated concept. It further suggests the manners in which three categories of PHW inductors can influence PHW directly and indirectly, as well as a possible sequence in which perceptions accumulate as part of the teachers' experience and result in better or poorer psychological health at work. This sequence is compatible with theoretical propositions suggesting an active coping process by workers in which personal resources are first solicited in the face of demands, followed by resources available in the environment, to adapt to the work context (de Jonge, Dormann, & van den Tooren, 2008).

Based on this model, some intervention strategies could be recommended. First, this research suggests that all categories of predictors provided an added value in predicting PHW and could be used in comprehensive intervention plans to improve psychological health at work. Personal resources, which are not always included in predictive models, appear to explain, either directly or indirectly, a substantial proportion of PHW in teachers. This is consistent with other studies on teachers (Badri et al., 2013; Lent et al., 2011; Salanova, Bakker & Llorens, 2006) as well as with a large body of literature (Diener et al., 1999; Lent, 2004; Steel, Schmidt, & Shultz, 2008; Xanthopoulou et al., 2007, 2009ab) indicating that psychological resources (e.g., optimism, self-efficacy, low level of negative affectivity) play a core role in shaping individuals' perceptions of their work environments and of themselves. Therefore, it would be possible to (a) increase individuals' awareness of the influence of their cognitions on PHW, (b) build and broaden individuals' personal resources through coaching and training interventions (Luthans, Avey, & Patera, 2008) or (c) select more resourceful individuals when it is justified by the job context. Second, interventions intended to change the work context should also be considered to help increase PHW because work-related demands and resources are directly and indirectly related to PHW. Reducing the quantity of job demands (e.g., class overload) is likely to have a quicker effect on PHW compared with interventions intended to build personal resources. Additionally, reducing the pressure to perform might also improve the social climate in an organization. Consistent with propositions from self-determination theory (Deci & Ryan, 2000; Gagné & Forest, 2008), social-organizational resources strongly predict needs satisfaction which, in turn, promotes PHW. Therefore, interventions designed to develop these social-organizational resources are important for fostering needs satisfaction and PHW of all workers, including those who have weaker personal resources. Managerial support for autonomy, recognition, fair treatment of all employees, and inclusion in decision making could help create nurturing environments where workers' basic needs are satisfied.

Limitations

The present study has certain limitations. First, we used non-random and non-representative nationally distinct samples of teachers to test the invariance of the predictive model of PHW. Therefore, the samples we compared may not reflect completely or equally national differences with regard to their respective country or region. Second, because this study relied on self-reported data collected in a cross-sectional design, causality of relationships cannot be inferred based on this study. Longitudinal and diary studies would be needed to shed light on the direction of causality between variables as well as the ways that job demands, job resources, personal resources, and needs satisfaction fluctuate in the prediction of PHW (Xanthopoulou et al., 2009b). Nevertheless, the current study provides added value over the available longitudinal studies because the latter rarely include in a single model the three categories of predictors evaluated and even more rarely examined PHW simultaneously across two countries. Future studies could delve further in this regard and extend our model to include other categories of PHW predictors (e.g., personal/family demands; Peeters, Mongomery, Bakker, & Schaufeli, 2005) and complementary psychological intervening variables (e.g. needs frustrations; Gillet, Fouquereau, Lequuerre, Bigot, & Mokounkolo, 2012) to predict PHW and its facets among different type of samples.

Finally, as far as understanding of the dynamic of factors leading to PHW is concerned, the present study should not be considered in isolation. Longitudinal studies have accumulated recently to suggest that PHW and its inductors (e.g. demands and resources) are reciprocally related in such ways that the PHW inductors influence PHW and vice versa (Bakker & Bal, 2010; Llorens et al., 2007; Salanova et al., 2006; Schaufeli, Bakker, & Van Rhenen, 2009; Simbula, Guglielmi, & Schaufeli, 2011; Xanthopolou et al., 2009ab). These studies indicate that an initial positive psychological health predicts an increase in future personal resources (e.g., optimism, self-efficacy, etc.) and job resources (e.g., social support, autonomy, coaching, etc.). Moreover, personal and organizational resources are reciprocally related (Xanthopoulou et al., 2009a; Llorens et al., 2007; Salanova et al., 2006), suggesting there is an upward positive spiral effect or a gain cycle in the creation and/or perception of resources as proposed by the conservation of resources theory (Hofboll, 2002). These self-reinforcing effects have been observed both when personal resources were considered in their dispositional aspect (e.g. Xanthopoulou et al., 2009a) and in their transient state aspect (e.g. Llorens et al., 2007; Xanthopoulou et al., 2009b). Future research and interventions should therefore take into account that personal resources can be modified by the work context and that personal resources can modify the work context experienced by individuals. Therefore, based on available evidences in the literature, it appears that practitioners have different entry points to influence PHW given that the latter is governed by a dynamic and self-reinforcing system of predictors.

Conclusion

This study provides evidence that the predictive model of PHW studied is tenable in samples of teachers from France and Canada. The fact that the results were replicated indicates that this model is a valid representation of reality that generalizes beyond its initial validation context. Based on these encouraging results, future research should continue to validate this model with contexts (e.g., collectivist culture) and populations (other job types) that differ from those evaluated thus far. Presently, this predictive model could be used to help develop and validate programs to prevent psychological health problems in teachers in both France and the province of Quebec in Canada.

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