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# Directionality of the associations between psychological empowerment and behavioral involvement: A longitudinal autoregressive cross lagged analysis

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Abstract

Many cross-sectional studies have suggested that psychological empowerment – a higher-order motivational construct – is related to employees' in-role and extra-role behavioral involvement. The objective of the present study is to assess the directionality of the longitudinal relationships between psychological empowerment (PE) and employees' behavioral involvement (BI). Based on theories, three alternative causal directions are examined: two unidirectional models (PE → BI, BI → PE) and one reciprocal model including effects in both directions. A total of 818 healthcare workers completed self-report questionnaires at three time points, equally spaced by a one-year lag. The results from autoregressive cross-lagged fully latent structural equation models showed that on the construct level, PE significantly predicts subsequent BI, while the reverse causality was not supported. However, the exploration of relationships at the dimension level of PE suggests the existence of reverse and reciprocal relationship between some PE and BI dimensions. Consistent with previous longitudinal studies, levels of psychological empowerment especially, but also behavioral involvement, appeared to be very stable over time. Theoretical and practical implications are discussed.

**Keywords**: empowerment, in-role behaviors, extra-role behaviors, longitudinal study

## Practitioner Points

- **Psychological empowerment – as a global motivational state where all dimensions are present (meaning, competence, self-determination, and impact) – appears to be a useful lever for lasting and pervasive effects on behavioral involvement. Organizational interventions could therefore prioritize the development of these critical cognitions to empower employees to subsequently perform in-role and extra-role behaviors.**
- **Encouraging behavioral involvement at the organizational level (e.g., asking an individual to participate and voice on organization issues) could alternatively be the best strategy to increase subsequent level of three PE cognitions (e.g., competence, self-determination, and impact).**
- **The stability of the psychological empowerment and behavioral involvement constructs could indicate the importance of appropriate selection and work environment sustaining employees' empowerment.**

Many organizations are interested in employee empowerment, partly because empowering management practices purportedly allow employees to elicit positive changes in their role, unit and organization and to maximally contribute to organizational effectiveness (Lawler, 1992; Randolph, 1995). Recent empowerment research has shifted from an emphasis on managerial practices to a focus on employees' cognitions. This perspective defines psychological empowerment as a mindset reflecting a deep psychological involvement of employees in their work (Spreitzer, 2008), which supposedly leads to proactive behaviors (e.g., extra-efforts, citizenship behaviors, innovation).

Psychological empowerment (PE) defines an active motivational orientation towards one's work role that captures the extent to which an individual feels a sense of being in control at work. It is composed of four job-related cognitions: meaning, competence, self-determination and impact (Spreitzer, 1995). *Meaning* refers to the fit between the job and one's values, beliefs and standards. *Competence* is the self-evaluated belief that one possesses the skills and abilities to perform one's job. *Self-determination* involves having a sense of control over one's actions. Finally, *impact* is the belief that one can have influence over strategic, administrative or operational outcomes. A recent meta-analysis suggested that these four cognitions are best represented as a unitary higher-order construct reflecting employees' psychological empowerment (Seibert, Wang & Courtright, 2011).

Empowerment theorists (Lashley, 1999; Robbins, Crino & Fredendall, 2002; Spreitzer, 1995, 2008; Thomas & Velthouse, 1990) posited PE as a mediator linking work context (i.e., empowering management practices) and employee empowered behaviors (i.e., behavioral involvement). Many behaviors have been proposed as consequences of PE, covering employees' in-role and extra-role contributions (Boudrias, Gaudreau, Savoie & Morin, 2009; Spreitzer, 2008). For instance, empowerment theory proposes that psychologically empowered employees should be more involved when doing their jobs, adopt more proactive attitudes at work, strive to improve their work environments, and display initiatives showing that they care for their colleagues and want to contribute to the success of the organization (Bogler & Somec, 2004; Conger & Kanungo, 1988; Spreitzer, 1995, 1997; Thomas & Veltouse, 1990). Here, we refer to these actions as behavioral involvement (BI), which is defined as a set of empowered, active and relatively self-determined contributions of employees aiming at securing work effectiveness or at improving work efficiency

within the organization (Boudrias & Savoie, 2006).

Boudrias and Savoie (2006) developed a measure of BI incorporating a broad range of behavioral expressions of employee empowerment. In two studies (*N*=1121), Boudrias et al. (2009, 2010) confirmed the presence of five distinct, yet interrelated dimensions of BI: (a) conscientiousness in performing job tasks, which can be defined as completing expected tasks with proficiency; (b) improvement efforts in job tasks, which is to bring changes to do one's work better and make it more useful; (c) group collaboration to maximize group efficiency, which is to collaborate with one's colleagues to insure optimal workgroup performance, (d) personal initiative to improve group efficiency, which is to review workgroup processes and acting to increase their efficiency and (e) involvement at the organizational level, which is participation in the maintenance and amelioration of efficiency at the organizational level. Although the concept of BI was developed within the framework of empowerment theory, this construct encompasses many types of active contributions that are highly valued by organizations (Frese, 2008) and reflected in organizational research under other appellations. Thus the first dimension (a) corresponds to what is more commonly referred to as in-role behaviors, whereas the remaining dimensions (b, c, d, e) match the usual definition of extra-role behaviors (i.e. behaviors going beyond normal expectations, or organizational citizenship behaviors; Podsakoff, MacKenzie, Paine, & Bachrach, 2000).

Seibert and colleagues' (2011) meta-analysis substantiated that PE is related to various forms of BI, such as task performance ($r_c$ = .36, K = 34), citizenship behaviors ($r_c$ = .38, K = 17), and innovation ($r_c$ = .33, K = 9). However, most of the reviewed studies were cross-sectional. Currently, no longitudinal studies are available to contrast the directional hypothesis that "empowered behaviors are preceded by the cognition of psychological empowerment" (Robbins et al., 2002, p. 436) with the complementary hypothesis that employees who behave proactively in turn develop a stronger sense of PE. Interestingly, both relations are apparently to be expected. Building on a systematic review of existing longitudinal studies of PE and its alleged effects, which has not yet been done to our knowledge, this study aims to replicate and extend results by testing different causality hypotheses with panel data taken at three time points.

The dominant causal assumption inherent in most empowerment models assumes that

causality goes from PE to BI (PE → BI) (Lashley, 1999; Robbins et al., 2002; Spreitzer, 1995; Thomas & Velthouse, 1990). However, broader theoretical perspectives provide a complementary perspective on these relationships. For instance, Bem's self-perception theory (Bem, 1972) proposes that behaviors precede attitudes, thus suggesting the reverse causal hypothesis (BI → PE). An even more integrative possibility is suggested by Bandura's (1989) reciprocal determinism model, which is also acknowledged by empowerment theorists (Spreitzer, 1995; Thomas & Velthouse, 1990), but has not been researched. This extended framework explicitly expects bidirectional relations, including PE → BI relations, but adding a potential feedback loop (BI → PE→ BI) due to the possibility that freedom to behave proactively and to have an impact at work may in turn generate greater feelings of being empowered. However, without experimental or longitudinal verification, the directionality of these associations remains speculative. Since empowering managerial practices can be time-consuming and usually aim to modify employees' cognitions as a mean to change their behaviors, this verification has broad practical relevance.

**Longitudinal studies**

At the time of writing this study, we were not able to locate any panel studies in which the directionality of the associations between PE and BI was systematically investigated. Although some longitudinal studies have been published, these studies never systematically contrasted possible reciprocal relations between PE and BI. Yet, some longitudinal studies investigated the relationships between PE and various correlates. Interestingly, many of these studies were conducted in the health-care system, which is also the case for the present study. These organizations are usually characterized by bureaucratic structures that can limit feelings of PE, but where employee initiatives are critically needed to maintain organizational efficacy (Laschinger, Finegan, Samian & Wilks, 2001, 2004).

In a two-wave panel study with a one year lag on a sample of 1356 Swedish nurses, Hochewalder (2008) found that PE presented negative cross-sectional relations with burnout, but could not longitudinally replicate these associations. Rather, after controlling Time 1 levels of burnout, PE levels predicted *increases* in burnout symptoms at Time 2 (exhaustion: $\beta = .11$ to .15; lack of personal accomplishment: $\beta = .12$ to .14). However, some significant relationships were also observed between initial levels of burnout and decreases in PE (exhaustion: $\beta = -.09$; lack of personal

accomplishment: β = -.08), suggesting that the directionality of these associations might not be simply unidirectional (for possible mechanisms, see Edwards & Rothbard, 2000; Rothbard, 2001; Schaufeli & Bakker, 2004). Finally, important autoregressive links were found over one year for PE (β = .61 to .65), suggesting that PE may be relatively stable over time. These autoregressive relations are similar to the test-retest coefficients (r = .58 to .74) reported by Spreitzer (1995) over a five-month period.

Likewise, Laschinger et al. (2004) conducted a two-wave (3 years apart) panel study of 128 Canadian nurses involving PE, job satisfaction, and perception of empowering work conditions. Contrary to the significant results obtained from cross-sectional analyses of their Time 1 data (Laschinger et al., 2001), longitudinal analyses showed that PE did not predict later levels of job satisfaction. Again, initial levels of PE strongly predicted later levels of PE ($R^2$ = .46). These results also revealed significant longitudinal relationships through which the perception of empowering conditions predicted later levels of PE (β = .38), lending some support to empowerment theories suggesting that changes in work conditions should influence PE. However, consistent with a reciprocal model, a recent study (van Dierendonck & Dijkstra, 2012) showed that changes in subordinates' PE levels predicted perceptions of empowering leadership 3-months later (β = .18-.26).

In a longitudinal study of 174 US health-care workers, Greene-Shortridge (2008) found that while PE presents significant positive cross-sectional relations with performance dimensions (task, group, organization), the longitudinal associations between these variables over a 6 months-period were not significant (r = .02 to .14). In contrast, the longitudinal relations between PE and satisfaction, organizational commitment, and intent to leave the organization were all significant and in the expected directions. However, it should be noted that this study is based on a limited measure of PE from which the meaning dimension was omitted. Furthermore, this study did not contrast alternative directionality hypotheses, only reporting bidirectional longitudinal correlations. Finally, Zhou, Wang, Chen, and Shi (2012) found a small and significant longitudinal relation between a more complete measure of PE and in-role performance assessed 3-months later (β = .10), again failing to contrast alternative directionality hypotheses.

Overall, these studies point to the importance of longitudinal research, since cross-sectional associations were seldom found to provide good indications regarding longitudinal associations

between PE and BI or related constructs. Moreover, the directions of these relationships remain undetermined, as reverse or reciprocal effects were rarely considered. Nevertheless, results support the existence of significant longitudinal associations between work conditions and subsequent levels of PE (Laschinger et al., 2001), and between PE and subsequent affective outcomes (Greene-Shortridge, 2008) and task performance (Zhou et al., 2012). However, there is currently no longitudinal panel study including PE and BI to determine the directionality of their associations. This study will therefore bridge an important gap in the PE literature.

**Theoretical perspectives on the relations between PE and BI**

Over and above these longitudinal studies, various theoretical perspectives make strong assumptions regarding the directionality of the associations between PE and BI. First, the dominant directional hypothesis stemming from empowerment theories suggests that PE should predict in-role and extra-role behaviors. This proposition lies at the core of Spreitzer's (1995) model of PE, which posits that empowered employees care about quality and performance because they perceive their work as meaningful. Similarly, feelings of competence are purported to help employees persist in their work assignments even when facing obstacles (Bandura & Locke, 2003). Further, feelings of self-determination and impact at work help increase employees' awareness of their own influence on their task performance (Hackman & Oldham, 1980). PE is also expected to enable specific extra-role contributions, such as personal initiatives, task revision, and continuous improvement (Alge, Ballinger, Tangirala & Oakley, 2006; Boudrias et al., 2009; Choi, 2007; Spreitzer, 2008), corresponding to the remaining BI dimensions. These extra-role contributions are highly relevant outcomes based on the aims of empowering management, which include offsetting the effects of bureaucratic dysfunctions by giving employees greater latitude to solve daily problems through personal initiatives and horizontal collaboration (Kanter, 1983; Lawler, 1992). According to Spreizter (1995, p.1444), a psychologically empowered individual usually "… wishes and feels able to shape his or her work role and context", which should enable behaviors aimed at improving the ways of doing things in their tasks, workgroup and the organization. Therefore, the dominant causal assumption of empowerment models (Spreitzer, 2008) hypothesizes that PE predicts subsequent levels of behavioral involvement (BI).

Without explicitly excluding PE theory's dominant causal assumption, Bem's self-perception theory (Bem, 1972) suggests a reversed causal hypothesis based on the proposition that individuals evaluate their attitudes based on past behaviors. When applied to the relationships considered here, this theory suggests that employees would, after an attempt to impact their work environment, rationalize that they would not have made that attempt without being confident of being able to have an impact – the behavior thus precedes the attitude. Likewise, completing tasks with competence should allow individuals to perceive themselves as competent; involving themselves in their task, group and organizations should lead employees to believe that what they do is important and meaningful; and acting with initiative should lead to feelings of self-determination. From this second theoretical assumption, it is thus hypothesized that BI will positively predict subsequent levels of PE.

An even broader theoretical perspective is provided by Bandura's (1989) reciprocal determinism model, which rather suggests that behaviors, environment, and cognitions all have mutual influence over each other. Applied to the PE-BI relationships, this model predicts that employee's BI would help to shape the work context in a manner that allows for more PE (e.g., Robbins et al., 2002; Spreitzer, 2008). In turn, increased levels of PE would, through the mechanisms exposed above, bring about even greater levels of BI. Thomas and Velthouse (1990) further mention that PE cognitions, "…through their effects upon behaviors and consequences, have the tendency to initiate self-reinforcing cycles"(p.673). Therefore, within this third theoretical background, we can expect both causal direction hypotheses (PE → BI and BI → PE) to be supported.

While there is no specific mention in the empowerment literature about how much time these self-reinforcing cycles (e.g., reciprocal relationships) might take to unfold, it is presumed that a change in the work context associated to one's personal action is at play. For example, a change in the structural or cultural organizational context might take years to be perceptible, whereas changes towards a more empowering leadership context might take months to occur (van Dierendonck & Dijkstra, 2012). In comparison, the PE-BI linkages proposed in the two unidirectional models might be observed at their strongest magnitude within a shorter time frame, based on the fact that motivational and rationalization process might fade over time if not sustained. Nevertheless, the nature of the BI dimensions studied in this article, such as improvement efforts, need time (e.g., many

months) to be measured in a real organizational context since these kinds of contributions are not necessarily part of everyday life at work. Thus, over many months (as in this study), each of the three directionality models could be hypothesized as plausible explanation of PE-BI linkages because all models rest upon some confirmation process to be sustained. We therefore set them as competing hypotheses in this study.

**Exploration of the role of specific PE cognitions**

While Seibert et al.'s (2011) meta-analysis empirically supports that the four PE cognitions have equivalent effects on work outcomes and form a higher-order construct, others researchers proposed that these cognitions could have different antecedents and outcomes based on theoretical considerations (Kraimer, Seibert & Liden, 1999; Spreitzer, 1997; Wat & Schaffer, 2004). While it is difficult to set a priori hypotheses as to the specific linkages between PE cognitions and BI dimensions given the current state of the scientific literature (Spreitzer, 2008), some studies hint at expected relationships. For instance, Liden and Arad (1996) suggest that competence and self-determination may represent prerequisites for the exercise of power while impact might depict the actual use of this power on one's work context. Conversely, the meaning dimension could be more intimately related to affective commitment and altruistic behaviors (Spreitzer, 2008; Wat & Schaffer, 2004), and therefore involve greater levels of communion with others and the organization (Rosso, Dekas & Wrzesniewski, 2010). Thus, the meaning cognitions could be more strongly related to collaborative forms of behavioral involvement (i.e., in-role performance, group collaboration) while the remaining cognitions could be more importantly related to assertive and influence-oriented behaviors (e.g., improvement efforts, organizational involvement). Otherwise, competence and impact, as key determinants of successfully influencing others or one's work environment (Spreitzer, 1997), might be primary drivers of behavioral involvement in the work group and the organization. Finally, self-determination is primarily related to the autonomous initiation and persistence of a course of action (Deci & Ryan, 1985), and could therefore predict any behavior.

Moreover, behaviors might themselves predict specific PE cognitions. Thus, having the possibility to perform one's tasks conscientiously and efficiently could strengthen feelings of job meaningfulness and competence (Morse & Weiss, 1955; Rosso et al., 2010). Also, behavioral

involvement beyond one's specific tasks (i.e., group and organization involvement) represents an important opportunity for the acquisition of new skills, thus improving feelings of competence and of being able to make a difference at work (i.e., impact). Finally, opportunities to perform self-initiated non-mandatory extra-role behaviors or having latitude in the performance of in-role behaviors might equally sustain self-determination.

Therefore, this study will explore whether the direction of causality involving the four PE dimensions taken separately follows the same pattern as the second-order construct. This additional exploratory investigation represents an important contribution of the present study as this systematic contrast of results based on a higher-order PE constructs versus separate cognitions has never been conducted in longitudinal research.

## Method

### Participants and procedure

Participants were recruited in a consortium of health-care organizations specializing in long term care and rehabilitation affiliated to a Canadian University. This study began in 2007 and relied on a three-wave panel design. All measures were collected during working hours in three consecutive years, at the same period of the year. While this one-year lag was chosen mainly for practical reasons, it was deemed appropriate based on previous studies indicating that PE tends to be relatively stable over one (Hochewalder, 2008) and three years (Laschinger et al., 2004) in public health-care settings. Further, based on longitudinal empirical literature, a one-year lag can be considered a good compromise to allow for the detection of normal causality effects (attitude → behavior), which tend to decline over six months, as well as reverse causality effects (behavior → attitude), that might take more time to unfold as these are potentially mediated by perceptions of the impact of one's actions and changes in the work context (Riketta, 2008; Zapf, Dormann & Frese, 1996).

To match participants' data in the three measurement waves, we relied on an anonymous code known only to participants. A total of 409 employees (corresponding to an answering rate of 50% of the available employees – which exclude those on unpaid leaves) completed questionnaires at Time 1, 484 (50%) completed questionnaires at Time 2 and 423 (43%) completed questionnaires at Time 3. A total of 818 employees participated in this study at least once during the three year follow-up period.

Of those employees: (a) 81% are women; (b) 21% are less than 30 years old, 51% are between 30 and 50 years old, and 27% are more than 50 years old; (c) 39% have less than 5 years of organizational tenure, 42% have between 5 and 20 years of organizational tenure, et 19% have more than 20 years of organizational tenure; (d) 43% have a high school diploma or less, 24% have a CEGEP diploma (a Quebec-specific 2 to 3 year school level occurring between grade 11 and undergraduate university studies), and 33% have a university diploma; (e) 90.2% hold a position involving the provision of direct health care services to the patients (nurses, nurses assistants, etc.), 6.6% are support employees, and 3.2% are managers.

**Organizational context**

This study was performed in an organization that is part of the public Canadian healthcare system which was characterized, at the time of the study, by ongoing change initiatives aimed at increasing the efficiency of patient-care in a context of limited resources, population aging and a shortage of qualified personnel (Hamelin Brabant, Lavoie-Tremblay, Viens, & Lefrançois, 2007; Laschinger et al., 2004). For instance, the organization underwent mergers of services, relocations of services to new locations, and restructuring of service provision among health care professionals. These multiple initiatives were introduced by management over an extended period and had the consequence of enriching work roles of many employees and to give considerable opportunity to voice improvement ideas. Therefore, albeit not directly measured in this study, the organizational context could be considered favorable to employee empowerment and BI.

**Measures**

**Psychological empowerment**. PE was measured with a French adaptation of Spreitzer's (1995) instrument, measuring each dimension with three items (Boudrias, Rousseau, Migneault et al., 2010). This questionnaire measures employees' perceptions of meaning (e.g., *The work I do is meaningful to me*), competence (e.g., *I am self-assured about my capabilities to perform my work activities*), self-determination (e.g., *I can decide on my own how to go about doing my work*), and impact (e.g., *My impact on what happens in my workgroup is large*). Employees indicated their agreement with each item (1= strongly disagree to 5 = strongly agree). Validity evidence for the higher-order structure of this questionnaire has been reported in a prior study (Boudrias et al. 2010).

**Behavioral involvement.** Boudrias & Savoie's (2006) instrument was used to measure employee BI and was built so as to provide an integrative coverage of the possible behavioral expressions of empowerment. This questionnaire assesses whether employees (a) conscientiously perform their job tasks (7 items, e.g., *adequately carry out the tasks related to my job*), (b) display improvement efforts in their job tasks (3 items, e.g., *make changes to improve efficiency in performing my tasks*), (c) effectively collaborate with others in order to improve team efficiency (3 items, e.g., *providing constructive feedback that helps my coworkers*), (d) display personal efforts to improve their workgroup efficiency (3 items, e.g., *introduce new ways of doing things in my workgroup*), and (e) get involved in the organization (5 items, e.g., *make suggestions to improve the organization's functioning*). Respondents indicated the frequency (1 = rarely to 5 = very often) with which they performed the behaviors in the past six months when opportunities were available. Validity evidence for this questionnaire has been reported in past studies (Boudrias & Savoie, 2006; Boudrias et al. 2009, 2010).

**Analyses**

Table 1 presents the descriptive statistics and zero-order correlations. To account for the ordered-categorical nature of the responses scales used in the measurement instruments, all models were estimated with the robust weight least square estimator (WLSMV, Beauducel, & Herzberg, 2006; Finney, & DiStefano, 2006). Furthermore, given that some employees only answered one (n = 447) or two (n = 244) measurement points, all models were estimated based on the full information that was available, based on algorithms implemented in Mplus 6.1 for WLSMV estimation (Muthén & Muthén, 2010). This procedure estimates models based on the full information available, without replacing missing values through suboptimal procedures. Such procedures are recognized as having comparable efficacy as more computer intensive multiple imputation procedures (Enders, 2010; Graham, 2009), and to supersede them in some situations (Larsen, 2011), even under very high levels of missing data (e.g. 50%) under Missing At Random (MAR) assumptions, and even in some cases to violations of this assumption. Under WLSMV estimation, missingness is allowed to be conditional on all covariates (i.e. predictors) present in the models, which includes the variables themselves at preceding time points in the context of the models estimated here. Preliminary verifications also

suggested that missing time points were unrelated to the demographic variables and to previous levels on the construct of interests. For these reasons, coupled with the longitudinal stability of the constructs measured here and the overall invariance/equilibrium of the measurement and predictive model (see the results section), we are confident that missing time points induced no biases in the estimation of the models. As a further verification, we also re-estimated all models based on the subsample of participants who completed at least two measurement points (n = 371) and found that the results remain substantively unchanged (results available upon request).

The fit of all models was evaluated using various indices as operationalized in Mplus 6.1 in conjunction with the WLSMV estimator (Hu, & Bentler, 1999; Yu, 2002): the WLSMV Chi-square statistic ($\chi^2$), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and the Root Mean Square Error of Approximation (RMSEA). Values greater than .90 for CFI and TLI are considered to be indicative of adequate model fit, although values approaching .95 are preferable. Values smaller than .08 or .05 for the RMSEA support respectively acceptable and good model fit. However, the estimated WLSMV chi-square values are not exact, but rather adjusted or "*estimated*" to obtain a correct *p*-value. This explains why $\chi^2$ and CFI values can be non-monotonic with model complexity. For the CFI, improvement when constraints are added should thus be interpreted as random. This specificity is also important for the $\chi^2$ difference tests, which need to be conducted via Mplus' DIFFTEST function (MD$\Delta\chi^2$; Asparouhov, & Muthén, 2006). Because MD$\Delta\chi^2$ tends to be oversensitive to sample size and to minor model misspecifications, it is recommended to use additional indices to complement chi-square difference tests when comparing nested models, such as in invariance test (Chen, 2007; Cheung, & Rensvold, 2002; Vandenberg, & Lance, 2000). A CFI diminution of .01 or less and a RMSEA augmentation of .015 or less between a model and the preceding model indicate that the invariance hypothesis should not be rejected.

**Confirmatory Factor Analyses**

We first verified the adequacy of the a priori longitudinal factor model that will be contrasted in this study. Specifically, we estimated a confirmatory factor analytic model including, at each time point, 5 first-order BI factors (5 factors * 3 time points = 15 factors), 4 first-order PE factors (12 factors), and one higher-order PE factor (3 higher-order factors). This model was specified as

congeneric, with each item allowed to load on a single factor, and all factors allowed to correlate within and across time points. Based on recommendations for longitudinal research, correlated residuals between matching indicators of the factors utilized at the three time points were included to avoid converging on biased and inflated stability estimates (Marsh, 2007).

An important assumption of longitudinal models is that the measured constructs remain the same across time (i.e. measurement invariance, Meredith, 1993; Millsap, 2011) and that the overall longitudinal system has reached equilibrium. Equilibrium means that the pattern of associations between constructs remains the same across time periods, so that the observed results can be expected to generalize across different time periods. This is generally expected when the study does not target specific developmental transitions or experimental interventions (Cole & Maxwell, 2003).

Tests of measurement invariance across time points were thus conducted first in order to verify that the definitions of the constructs had not changed over time and whether the longitudinal system had reached equilibrium. These tests were performed in a sequential strategy devised through a combination of recommendations for first-order factor models (Meredith, 1993) and recommendations for higher-order factor models (Cheung, 2008), extended to the specificities of longitudinal research and to WLSMV estimation (Millsap, 2011; Morin, Moullec, Maïano, Layet, Just, & Ninot, 2011). For identification purposes, the measurement invariance of the first-order factor model thus needed to be estimated first in the following sequence: (i) configural invariance (same measurement model), (ii) weak invariance (invariance of the factor loadings); (iii) strong invariance (invariance of the loadings and thresholds; with ordered categorical items, thresholds replace the intercepts and reflect the points at which the scores change from one category to another); (iv) strict invariance (invariance of the loadings, thresholds and residuals), (v) invariance of correlated residuals among matching items (invariance of the loadings, thresholds, residuals and correlated residuals); (vi) invariance of the variances and covariance within the BI and PE constructs separately within time period, (vii) invariance of the factor covariance between the BI and PE constructs within time period, (viii) latent means invariance. Then, the invariance of the higher-order structure was verified in a similar sequence, with the baseline model specified as invariant over time according to the conclusions of steps (i) to (v) of the preceding sequence.

**Longitudinal Models**

The measurement part of the predictive models was specified according to the conclusions of the higher-order invariance tests. As a baseline model, we first estimated an autoregressive model in which each latent construct predicted itself over time. More precisely, in the first estimated model, the higher-order PE factor predicted itself over time (t) ($PE_t \rightarrow PE_{t+1}$), and each of the five first-order BI factors (BI1 to BI5 for simplicity) predicted themselves over time ($BI1_t \rightarrow BI1_{t+1}$; $BI2_t \rightarrow BI2_{t+1}$; $BI3_t \rightarrow BI3_{t+1}$; $BI4_t \rightarrow BI4_{t+1}$; $BI5_t \rightarrow BI5_{t+1}$). All other longitudinal regressions/correlations were constrained to be zero, but correlations between constructs were freely estimated within time waves. Then, reciprocal cross-lagged paths in which latent constructs measured at Time t were allowed to predict the other constructs at Time t+1 were added ($PE_t \rightarrow BI1_{t+1}$; $PE_t \rightarrow BI2_{t+1}$; $PE_t \rightarrow BI3_{t+1}$; $PE_t \rightarrow BI4_{t+1}$; $PE_t \rightarrow BI5_{t+1}$; $BI1_t \rightarrow PE_{t+1}$; $BI2_t \rightarrow PE_{t+1}$; $BI3_t \rightarrow PE_{t+1}$; $BI4_t \rightarrow PE_{t+1}$; $BI5_t \rightarrow PE_{t+1}$) to the model (see Appendix A for a detailed technical presentation). It has to be noted that these analyses were performed with and without the inclusion of demographic control variables. Since the results remain the same, we only report the results without controls, which enable the provision of the standard errors associated with the standardized solution.

## Results

**Confirmatory Factor Analyses**

The fit results from the confirmatory factor analyses are reported in Table 2. These results confirm the adequacy of the a priori longitudinal measurement model with indices indicating excellent fit (RMSEA $\leq$ .05; CFI and TLI $\geq$ .95). Tests of measurement invariance for the first- and higher-order structure supported the complete measurement invariance of the models (configuration, loadings, thresholds/intercepts, residuals/disturbances, correlated residuals/disturbances) and the complete equilibrium of the system (variances, covariances, and latent means) over time. This shows that the longitudinal system has reached stability and that results can be expected to generalize to longer periods than the three years considered here. Indeed, none of the changes in fit indices exceeded the recommended cut-off scores of .01 for the CFI and .015 for the RMSEA. The TLI likewise showed no changes exceeding .002.

**Main Analyses: Testing Predictive Longitudinal Models**

The fit indices from the main predictive models are reported in Table 3. The baseline autoregressive model (M1) provides an excellent fit to the data (RMSEA ≤ .06; CFI and TLI ≥ .95) and fit indices show very few variations from this model to the next models. As could be expected from the results of the preliminary models showing the longitudinal equilibrium of the system, these autoregressive paths were found to be invariant across time periods, as shown by the lack of noteworthy change in model fit (M2). These observations, coupled with the fact that more complex models in the sequence do not show any substantial increase in fit, illustrate the great temporal stability of PE and BI, revealing that the main source of longitudinal relations between these constructs is horizontal (i.e. autoregressive paths).

Then, cross-lagged paths were added to the models (M3). Although the fit indices show few notable changes with these additions, some of these relationships turned out to be systematically significant ($PE_t \rightarrow BI_{t+1}$ but not $BI_t \rightarrow PE_{t+1}$) and the $MD\Delta\chi^2$ showed a significant improvement ($MD\Delta\chi^2 = 38.143$, $\Delta df = 20$, $p \leq .01$). These observations indicate that this model provides valuable additional information and that, although the main sources of the longitudinal associations between the constructs remain horizontal, cross-lagged relations are also present, showing that PE predicts fluctuations in BI at later time points. Once again, these relations proved fully invariant across time points (M4). The main results from this model are reported in Table 4.

Therefore, the reverse and reciprocal causality hypotheses were not empirically supported when PE is studied as the construct level. Conversely, the dominant causality hypothesis that PE predicts BI is empirically supported for four out of five BI dimensions (the exception being task improvement).

**Exploration of effects across PE dimensions**

The previous measurement model depicted PE as a higher-order construct defined from the four first-order construct, which proved highly correlated to one another in the first-order measurement model. Although none of the time-specific correlations between the four PE cognitions proved problematically high (see Table 1 with $r = .17$ to $.55$, $M = 0.34$), the inclusion of all of these dimensions into a single predictive model without the overarching higher-order construct created

issues of multicolinearity, resulting in unstable, non-converging, or potentially erroneous estimations. For this reason, models were estimated separately for each dimension of PE. The results of these analyses (Table 5) should thus be interpreted with caution as they are possibly subject to an increase in type 1 error and redundancy. However, the highly differentiated pattern of results observed for each PE dimension provides some support for the dimension-specificity of the results.

At the dimension level, results replicate the pattern obtained with construct level analyses, but bring further nuances in the relationship. First, the result again showed significant relations whereby PE cognitions predicted BI dimensions, and these relations were generally clearer (i.e. slightly higher coefficients and lower standard errors). However, the results showed that some reciprocal relations going from BI dimensions to PE cognitions were also significant. When PE dimensions predict subsequent BI dimensions, it appears that: (1) task conscientiousness is predicted by meaning and self-determination; (2) task improvement is not related to PE; (3) group collaboration, group improvement and organizational involvement are all predicted by impact; (4) organizational involvement is also predicted by self-determination. Conversely, when BI dimensions predict subsequent PE cognitions, meaning is predicted by task conscientiousness, while competence, self-determination and impact are all predicted by organizational involvement. In sum, the results suggest three potential reciprocal self-reinforcing loops involving (1) meaning and task conscientiousness, (2) impact and organizational involvement, and (3) self-determination and organizational involvement.

## Discussion

This study is the first to verify the direction of causality between PE and BI in the workplace. The results of the construct-level analyses, consistent with conventional wisdom in empowerment theories (Lashley, 1999; Seibert et al., 2011; Spreitzer, 1995), indicate that the most probable causal ordering is that PE precedes BI. Thus, it appears that the main direction of causality hypothesized in psychological empowerment models is indeed the most likely manner through which these relations are expressed. However, the dimension-level analyses open the door to a far more nuanced picture. These analyses revealed some potential effects going from BI dimensions to the PE cognitions, and pointed to possible self-reinforcing feedback loops between some dimensions of PE and BI.

### Theoretical implications

At the global construct level, the demonstration that PE generally precedes behaviors constitutes an interesting addition to psychological empowerment theories (Spreitzer, 1995, 2008; Thomas & Velthouse, 1990). In doing so, we complement a previous longitudinal study in health-care settings showing that structural empowerment initiatives predicted later levels of PE (Laschinger et al., 2004). Therefore, a larger spectrum of the "normal" process suggested in empowerment models (changes in work context → PE → behavioral involvement) has now received empirical support in a health-care organizational context. However, no longitudinal research has studied all the variables in this process to confirm this sequence.

Consistent with theory (Spreitzer, 1995, 2008) and a recent meta-analysis of cross-sectional studies (Seibert et al., 2011), PE predicts both in-role (e.g., task conscientiousness) and extra-role (e.g., efforts to improve workgroup efficiency through personal and collaborative actions, and organizational involvement) behaviors. It is interesting to note that task improvement was the only dimension of BI not predicted by PE. It is possible that this is due to a particularity of our sample. Health care procedures tend to be formalized, meaning that opportunities for personally-led task improvement might be restricted. However, as mentioned, the organization where we collected the data was actively putting forward measures to encourage empowerment and involvement. As such, another hypothesis could be that employees might not be motivated to change what they do when it actually allows them to feel empowered.

At the dimension level, BI at the organizational level predicts subsequent levels for three PE dimensions (competence, self-determination and impact), while task conscientiousness predicts one (meaning). These findings thus support the suggestion that having the possibility to influence what happens at the organization level, a larger target than one's workgroup or tasks, is likely to reinforce perceptions of being competent, self-determined and able to exert an impact in the workplace. Similarly, getting conscientiously involved in task execution may help to give a clearer meaning to these tasks (Morse & Weiss, 1955). Interestingly, these two dimensions of BI appear to be part of potential reciprocal self-reinforcing feedback loops. Therefore, while the typical pattern of causality where attitudes precedes behaviors is observed (Riketta, 2008), it also seem that some behaviors influence subsequent attitudes, in line with Bem (1972) and Bandura (1989) theories. It should be kept

in mind here that both Bem's and Bandura's theories are much broader than the specific relations considered here and as such, cannot be supported, or fully informed, by the results from this specific study. However, our results show that the implications of these models for empowerment theory and research have clearly received some support from the analyses conducted at the dimensional level. Empowerment theorists (Robbins et al., 2002; Spreizter, 1995; Thomas & Velthouse, 1990) who made allusion to these feedback loops thus appear to have been well-advised. However, these reciprocal feedback loops were generally proposed in an omnibus manner (for all PE and BI dimensions, or at the higher-order level for PE) without mentioning the possibility that these relations could differ at a dimensional level. Yet, our results show no evidence of omnibus reciprocal relations, but evidence of dimension-specificity.

The dimension-specificity observed in the context of the additional analyses should not be taken as an argument to ignore the observed global effects of the higher-order PE construct on most dimensions of BI. These two models and analyses have different implications and some reasons might explain the different results found at these two levels of analysis. For instance, the higher-order construct reflects the core of PE – the part of PE that is shared between the four cognitions – and thus represents a Gestalt of PE cognitions (Spreitzer, 2008). It is therefore possible that the specific PE cognitions may show a greater level of fluctuations over time due to a greater level of sensitivity to self-perception effects or reciprocal determinism feedback loops than the higher-order construct, which could be more stable, trait-like, and more closely anchored into socio-structural conditions – hierarchical position, employment status, etc. This suggestion is in line with findings from personality research (Costa & McCrae, 1995; Digman, 1990) that show that when one moves from dimensions to a more abstract level, construct stability tends to increase and to show less reactivity to contextual changes. As such, the higher-order construct of PE might be closer to personality traits than each dimension, and thus might be less open to modification based on behavioral involvement than the specific cognitions. Otherwise, the mechanisms at play in the evolution of each dimension of PE may be more specific, or different, than those at play for the overall PE construct, so that each may need to be considered separately to correctly understand its antecedents and outcomes (Edwards, 2000).

The observed support for a unidirectional relationship at the construct level and for reverse or

reciprocal effects at the dimension level suggests some refinements for empowerment theory. For example, the reverse relationships found between BI and PE at the dimension level tend to indicate that the meaning dimension does not operate in the same way than competence, self-determination and impact. This is in line with Liden and Arad's (1996) suggestion that meaning is different from the other three cognitions because no power is involved. Meaning refers to a sense of person-environment fit, which should encourage some form of maintenance behaviors. At the other end of the spectrum, impact is more change-oriented and implies that a person can successfully influence the course of actions in the organisation, making impact a more likely predictor for behavioral involvement in distal foci (i.e. work group, organization) than other PE cognitions. As such, while Seibert and colleagues' (2011) meta-analysis of cross-sectional studies found that all four PE cognitions were equivalent in the prediction of in-role and extra-role behaviors, our longitudinal study suggests that there might be relevant differences between these cognitions in the prediction of behavioral outcomes as well as in the understanding of the dynamic reciprocal relationships involved. Therefore the debate on whether PE should be considered as a multidimensional rather than a unitary higher-order construct (Spreitzer, 2008) is still relevant to future studies, especially longitudinal ones.

**Further considerations**

While this study's primary goal was to establish directionality of causation between PE and BI, our results bring to light other relevant issues. Firstly, longitudinal relationships found in this study between PE and in-role and extra-role behaviors ($\beta$ = .04 to .16) appear to be of lower magnitude than the correlation estimates reported in Seibert and colleagues' (2011) meta-analysis (*rc* = .33 to .38). Interestingly, the strongest relations involved the prediction of in-role behaviors (i.e. task conscientiousness) rather than extra-role dimensions. This could be because in-role behaviours represent the sole dimension of BI that is fully within the behavioural control of the employees whereas the enactment of extra-role behaviours is known to be also determined by opportunities (Zellars & Tepper, 2003). Another possibility suggested by a recent study (Huang, Iun, Liu & Gong, 2010) is that more consistent and stronger relationships could have been observed between PE and extra-role behaviors for managerial employees rather than non-managerial employees, who form most of our sample. The opportunity to enact these behaviors or the broader role of managers might thus

influence the magnitude of effects.

Secondly, consistent with previous longitudinal studies on PE, we found important auto-regressive coefficients (β = .89-.93), indicating that the better predictor of employees' PE is their previous level of PE (Greene-Shortridge, 2008; Hochewalder, 2008; Laschinger et al., 2004). Moreover, a correlation of .81 was found between PE latent factors over the three-year period. The magnitude of these relations suggests that PE may reflect, in part, a dispositional orientation. This possibility has been discussed by empowerment theorists. They suggest that PE may be influenced by interpretative styles (Thomas & Velthouse, 1990), locus of control, or self-esteem (Spreitzer, 1995; Robbins et al., 2002). Indeed, PE cognitions are similar to core self-evaluation traits (locus of control, self-esteem, generalized self-efficacy, emotional stability), which are usually considered as dispositional (Judge, Locke, & Durham, 1997), or as presenting a strong trait component (e.g., Butler, Hokanson, & Flynn, 1994; Morin, Maïano et al., 2011). In Seibert et al.'s (2011) meta-analysis, no contextual variable was related to PE more strongly than core self-evaluation. Therefore, empirical evidence seems to accumulate to suggest that PE may represent, at least in part, a disposition. However, before concluding that PE is dispositional rather than malleable, other possibilities would need to be ruled out (e.g., stability in the perceived role definition).

Finally, the time lag used in this study needs to be considered carefully to interpret results. At the construct level, the fact that we found support for empowerment theories main directional hypothesis (i.e., PE → BI), but not for the reciprocal effects anticipated on the basis of self-perception and reciprocal determinism theories (i.e., BI → PE) might be related to the one year lag used in this study. Indeed, it may take more than one year for employees to infer PE based on BI as employees may need to be behaviorally involved in a consistent manner for years before reaching the conclusion that they are psychologically empowered especially if the PE presents a dispositional component. Conversely, PE-to-BI effects could occur much faster as PE is proposed to directly potentiate BI so that, at high levels of PE, BI only requires opportunities to be expressed. Thus, the one year time lag that was used in this study may have simultaneously made it harder to detect BI-to-PE relations (than a longer time lag), while having resulted in potentially lower PE-to-BI relations (than a shorter time lag). Having said that, the fact that some effects were found at dimension level of PE could suggest

that the PE construct can still be built over one-year through BI influence on specific PE dimensions.

**Practical implications**

Because PE was found to be a predictor of future BI, managers should consider interventions to develop the four PE cognitions. Different intervention strategies are possible based on antecedents of PE (Seibert et al., 2011). For example, interventions falling under the "structural empowerment" umbrella (Laschinger et al., 2001, 2004) – high-involvement managerial practices, access to organizational resources and support, job redesign – could increase PE. Alternatively, according to results found at the dimension level, BI at the organizational level could be targeted to increase subsequent level of three cognitions (e.g., competence, self-determination, and impact) and create self-reinforcing PE-BI-PE cycles. Interestingly, organizational involvement is usually dependent on the presence of contextual opportunities, which should be made available as part of structural empowerment strategies.

Our results also show that the main cognitions that should be targeted are meaning and self-determination if one's goal is to reinforce task conscientiousness, whereas allowing employees' to have an impact (as well as self-determination to a lesser extent) is likely to reinforce extra-role behaviors. Similarly, the observed reverse relations suggest that allowing employees to play a role at the organizational level is likely to further their level of self-determination, competence, and impact. Interestingly, self-reinforcing feedback loops suggest that some interventions may have lasting effects on the employees, such as improving the meaningfulness of the tasks themselves, which should in turn lead to higher levels of conscientiousness, with reinforcing effects on increasing the meaningfulness of a task well-done. Allowing employees the opportunity to become involved at the organizational level is likely to further their feelings of self-determination and impact, with reinforcing effects on many facets of BI.

Finally, this research indicates that PE and BI seem highly stable over time. Therefore, another strategy for increasing PE could be to carefully select people with respect to job and organizational characteristics. Maximizing the person-job and the person-organization fit at the entry could increase the probability that PE cognitions will reach higher levels among employees after the initial training and socialization process. Otherwise, selection systems could target individuals that

already possess high levels of PE cognitions based on personal dispositions. These individuals would likely be more inclined to feel and behave in an empowered manner in a diversity of contexts.

**Limitations and directions for future research**

This research has limitations that need to be considered in the interpretation of the results. First, predictors and outcomes were measured with self-reported instruments. Therefore, response bias might have influenced the results. Future research should consider using external measures (e.g. supervisor ratings) to assess employees' BI to verify whether the present results replicate with external criteria. That said, self-reports have been identified as the most adequate source of information regarding cognitive states, such as PE, and hard-to-observe behaviors, such as BI (Vandenberg, Lance & Taylor, 2004). In fact, prior research showed that self-reports of BI correlate with supervisor ratings of the same dimensions (Boudrias & Savoie, 2006), with the exception of the group collaboration dimension, which may not be directly observable by supervisors. Further, the impact of shared method variance has also been overstated in multivariate analyses. Indeed, Siemsen, Roth, and Oliveira (2010) showed that analyses including multiple predictors assessed with the same method naturally control for shared method variance given that multivariate effects are estimated from each predictor's unique (i.e., not shared) contribution.

In addition, the results suggest that causal ordering at the global construct level is far more likely going from PE to BI, than otherwise. This pattern was consistent between the measurement waves, suggesting that the predictive system has reached equilibrium and that generalization of results can be expected. However, there still exists a possibility that the relationships between PE and BI might be due to a third unmeasured variable. Further, historical factors (e.g., mergers, relocations, appointment of new managers) might have influenced the surveyed employees in an unsystematic manner depending on their personal level of exposure to these factors, and may thus have exerted some unknown influence on the observed relationships. This points to the need to replicate these findings, and to conduct experimental laboratory studies aimed at manipulating levels of PE to ascertain their responsibility for behavioral outcome differences.

Finally, and most importantly, future longitudinal studies in organizations would benefit from measuring contextual antecedents of PE (e.g., structural empowerment, empowering leadership) to

more precisely identify the unique contribution of PE to BI. This would also enable longitudinal tests of mediation and a fuller exploration of the reciprocal relationships between work context, PE and BI based on Bandura's (1989) three-way determinism framework. In the present research, it was not possible to determine if PE-BI linkages where contingent upon modification of the perceived work context.

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**Table 1.** *Descriptive Statistics and Correlations between Study Variables*

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. | 26. | 27. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Meaning T1 | **(.79)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Meaning T2 | .63* | **(.84)** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Meaning T3 | .54* | .61* | **(.77)** | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Competence T1 | .45* | .44* | .23* | **(.75)** | | | | | | | | | | | | | | | | | | | | | | | |
| 5. Competence T2 | .40* | .49* | .36* | .69* | **(.71)** | | | | | | | | | | | | | | | | | | | | | | |
| 6. Competence T3 | .34* | .33* | .47* | .55* | .64* | **(.69)** | | | | | | | | | | | | | | | | | | | | | |
| 7. Self-determination T1 | .32* | .34* | .29* | .20* | .19* | .22* | **(.81)** | | | | | | | | | | | | | | | | | | | | |
| 8. Self-determination T2 | .20* | .40* | .31* | .14* | .25* | .22* | .67* | **(.82)** | | | | | | | | | | | | | | | | | | | |
| 9. Self-determination T3 | .09 | .25* | .34* | .04 | .24* | .30* | .52* | .53* | **(.83)** | | | | | | | | | | | | | | | | | | |
| 10. Impact T1 | .41* | .29* | .31* | .19* | .15* | .26* | .50* | .33* | .30* | **(.86)** | | | | | | | | | | | | | | | | | |
| 11. Impact T2 | .24* | .41* | .35* | .13 | .17* | .08 | .46* | .44* | .33* | .63* | **(.83)** | | | | | | | | | | | | | | | | |
| 12. Impact T3 | .15* | .23* | .30* | .02 | .04 | .24* | .26* | .34* | .45* | .55* | .66* | **(.83)** | | | | | | | | | | | | | | | |
| 13. Task conscientiousness T1 | .23* | .26* | .10 | .31* | .25* | .25* | .15* | .12 | .08 | .14* | .13* | .08 | **(.91)** | | | | | | | | | | | | | | |
| 14. Task conscientiousness T2 | .16* | .30* | .32* | .18* | .39* | .38* | .13 | .17* | .30* | .16* | .12* | .15* | .54* | **(.91)** | | | | | | | | | | | | | |
| 15. Task conscientiousness T3 | .17* | .33* | .26* | .17* | .37* | .28* | .01 | .31* | .17* | .14 | .18* | .14* | .34* | .49* | **(.91)** | | | | | | | | | | | | |
| 16. Task improvement T1 | .16* | .19* | .10 | .28* | .28* | .29* | .07 | .02 | .11 | .16* | .18* | .15* | .55* | .30* | .26* | **(.86)** | | | | | | | | | | | |
| 17. Task improvement T2 | .10 | .32* | .20* | .15* | .37* | .31* | .05 | .12* | .15* | .12 | .21* | .13 | .32* | .53* | .38* | .45* | **(.89)** | | | | | | | | | | |
| 18. Task improvement T3 | .15 | .26* | .23* | .14 | .22* | .28* | .02 | .10 | .12* | .12 | .12 | .17* | .20* | .28* | .57* | .43* | .53* | **(.91)** | | | | | | | | | |
| 19. Group collaboration T1 | .22* | .20* | .07 | .09 | .10 | .02 | .06 | .06 | -.13 | .26* | .29* | .12 | .31* | .18* | .13 | .39* | .23* | .21* | **(.72)** | | | | | | | | |
| 20. Group collaboration T2 | .16* | .25* | .26* | .06 | .24* | .19* | .10 | .13* | .20* | .23* | .35* | .24* | .13* | .39* | .21* | .26* | .50* | .24* | .44* | **(.70)** | | | | | | | |
| 21. Group collaboration T3 | .20* | .23* | .17* | .06 | .19* | .16* | .12 | .20* | .05 | .27* | .30* | .27* | .07 | .22* | .40* | .17* | .23* | .44* | .45* | .42* | **(.78)** | | | | | | |
| 22. Group improvement T1 | .08 | .08 | .03 | .06 | .01 | .00 | .04 | .00 | .01 | .30* | .31* | .21* | .21* | .10 | .13 | .41* | .27* | .39* | .59* | .36* | .32* | **(.88)** | | | | | |
| 23. Group improvement T2 | .10 | .19* | .12 | .04 | .18* | .05 | .14* | .07 | .09 | .28* | .39* | .29* | .16* | .23* | .14* | .29* | .48* | .27* | .41* | .68* | .43* | .57* | **(.90)** | | | | |
| 24. Group improvement T3 | .17* | .21* | .13* | .03 | .17* | .12* | .06 | .14* | -.01 | .26* | .36* | .31* | .19* | .18* | .26* | .28* | .30* | .45* | .47* | .39* | .67* | .52* | .52* | **(.89)** | | | |
| 25. Org. involvement T1 | .16* | .12 | .08 | .05 | .07 | .13 | .14* | .08 | .17* | .31* | .26* | .34* | .13* | .05 | .09 | .22* | .26* | .26* | .35* | .22* | .30* | .48* | .37* | .35* | **(.90)** | | |
| 26. Org. involvement T2 | .14* | .19* | .14* | .06 | .18* | .08 | .21* | .13* | .15* | .32* | .41* | .31* | .15* | .17* | .19* | .25* | .38* | .25* | .36* | .45* | .25* | .51* | .56* | .36* | .62* | **(.91)** | |
| 27. Org. involvement T3 | .10 | .18* | .20* | .01 | .18* | .16* | .12 | .13 | .13* | .23* | .32* | .31* | .21* | .15* | .18* | .17* | .20* | .29* | .28* | .23* | .39* | .35* | .40* | .47* | .57* | .66* | **(.90)** |
| Mean | 4.41 | 4.37 | 4.37 | 4.41 | 4.42 | 4.36 | 3.98 | 3.99 | 4.03 | 3.53 | 3.55 | 3.54 | 4.58 | 4.63 | 4.61 | 4.00 | 4.02 | 4.05 | 3.83 | 3.86 | 3.82 | 3.21 | 3.17 | 3.05 | 2.44 | 2.44 | 2.31 |
| SD | 0.66 | 0.72 | 0.64 | 0.59 | 0.57 | 0.59 | 0.92 | 0.95 | 0.92 | 0.97 | 0.90 | 0.90 | 0.60 | 0.57 | 0.57 | 0.89 | 0.90 | 0.93 | 0.86 | 0.83 | 0.88 | 1.12 | 1.15 | 1.10 | 1.13 | 1.13 | 1.12 |

*Note.* *: $p < .05$. Cronbach's alpha coefficients are displayed along the diagonal.

**Table 2**. Fit Results from the Confirmatory Factor Analytic Models

| Model | $\chi^2$ | df | RMSEA | (90% CI) | CFI | TLI | MD$\Delta\chi^2$ | $\Delta$df | $\Delta$RMSEA | $\Delta$CFI | $\Delta$TLI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 FO factors, 1 HO factor (PE) | 6074.445** | 4476 | 0.021 | (0.020 - 0.022) | 0.962 | 0.958 | --- | --- | --- | --- | --- |
| *Measurement invariance of the 9 FO factors* | | | | | | | | | | | |
| Configural | 5085.034** | 4302 | 0.015 | 0.013 0.017 | 0.981 | 0.979 | --- | --- | --- | --- | --- |
| Loadings | 5164.096** | 4351 | 0.015 | 0.013 0.017 | 0.981 | 0.978 | 136.084** | 49 | .000 | .000 | -.001 |
| Thresholds | 5332.080** | 4507 | 0.015 | 0.013 0.017 | 0.980 | 0.979 | 207.796** | 156 | .000 | -.001 | +.001 |
| Residuals | 5475.296** | 4573 | 0.016 | 0.014 0.017 | 0.978 | 0.977 | 188.233** | 66 | +.001 | -.002 | -.002 |
| Correlated Residuals | 5538.718** | 4639 | 0.015 | 0.014 0.017 | 0.978 | 0.977 | 74.286 | 66 | -.001 | .000 | .000 |
| Latent Variances and Covariance Within Construct (for PE and BI FO factors separately) | 5597.280** | 4689 | 0.015 | 0.014 0.017 | 0.978 | 0.977 | 81.234** | 50 | .000 | .000 | .000 |
| Within-Time Correlations Between Constructs (between PE and BI FO factors) | 5598.932** | 4729 | 0.015 | 0.013 0.017 | 0.979 | 0.979 | 53.152 | 40 | .000 | +.001 | +.002 |
| Latent Means | 5609.018** | 4747 | 0.015 | 0.013 0.016 | 0.979 | 0.979 | 21.976 | 18 | .000 | .000 | .000 |
| *Measurement invariance of the HO PE factor* | | | | | | | | | | | |
| Configural | 6810.655** | 4813 | 0.023 | (0.021 - 0.024) | 0.952 | 0.952 | --- | --- | --- | --- | --- |
| HO Loadings | 6805.782** | 4819 | 0.022 | (0.021 - 0.024) | 0.952 | 0.952 | 11.059 | 6 | .000 | .000 | .000 |
| HO Intercepts | 6812.717** | 4825 | 0.022 | (0.021 - 0.024) | 0.952 | 0.952 | 12.795* | 6 | .000 | .000 | .000 |
| HO Disturbances | 6799.550** | 4833 | 0.022 | (0.021 - 0.024) | 0.953 | 0.953 | 7.889 | 8 | .000 | +.001 | +.001 |
| HO Correlated Disturbances | 6796.193** | 4841 | 0.022 | (0.021 - 0.023) | 0.953 | 0.953 | 7.718 | 8 | .000 | .000 | .000 |
| HO Latent Variance | 6782.617** | 4843 | 0.022 | (0.021 - 0.023) | 0.954 | 0.953 | 0.869 | 2 | .000 | +.001 | .000 |
| HO Within-Time Correlations Between Constructs | 6749.239** | 4853 | 0.022 | (0.021 - 0.023) | 0.955 | 0.955 | 20.057* | 10 | .000 | +.001 | +.002 |
| HO Latent mean | 6745.608** | 4855 | 0.022 | (0.021 - 0.023) | 0.955 | 0.955 | 0.888 | 2 | .000 | .000 | .000 |

Notes. FO = First-order factor; HO: Higher-order factor; PE: Psychological empowerment; BI: Behavioral involvement; $\chi^2$: WLSMV chi square test of model fit; df: degrees of freedom; RMSEA: Root Mean Square Error of Approximation; CFI: confirmatory fit indices; TLI: Tucker-Lewis Index; $\Delta$ since previous model; MD$\Delta\chi^2$ : chi square difference test based on the Mplus DIFFTEST function for WLSMV estimation; **: $p < .01$; *: $p < .05$.

**Table 3**. Predictive Models

| Model | $\chi^2$ | df | RMSEA | (90% CI) | CFI | TLI |
|---|---|---|---|---|---|---|
| M1. Autoregressive | 6742.024** | 4937 | 0.021 | (0.020 - 0.022) | 0.957 | 0.957 |
| M2. Autoregressive, invariant across time | 6714.890** | 4943 | 0.021 | (0.020 - 0.022) | 0.958 | 0.958 |
| M3. PE → BI dimensions & BI dimensions → PE | 6793.380** | 4923 | 0.022 | (0.020 - 0.023) | 0.955 | 0.956 |
| M4. PE → BI dimensions & BI dimensions → PE, invariant across time | 6718.135** | 4933 | 0.021 | (0.020 - 0.022) | 0.957 | 0.958 |

Notes. PE: Psychological empowerment; BI: Behavioral involvement; $\chi^2$: WLSMV chi square test of model fit; df: degrees of freedom; RMSEA: Root Mean Square Error of Approximation; CFI: confirmatory fit indices; TLI: Tucker-Lewis Index; **: $p < .01$; *: $p < .05$.

**Table 4**. Standardized and unstandardized estimates for predictive models retained

| | | *Time 1 → Time 2* | | *Time 2 → Time 3* | |
|---|---|---|---|---|---|
| *Predictor* | *Outcome* | *b (S.E.)* | *ß (S.E.)* | *b (S.E.)* | *ß (S.E.)* |
| MODEL 4 | | | | | |
| PE | PE | .898 (.064) ** | .925 (.063) ** | .898 (.064) ** | .885 (.062) ** |
| Task conscientiousness | | .038 (.047) | .061 (.075) | .038 (.047) | .063 (.078) |
| Task improvement | | .017 (.046) | .027 (.071) | .017 (.046) | .029 (.077) |
| Group collaboration | | -.216 (.168) | -.177 (.135) | -.216 (.168) | -.178 (.136) |
| Group improvement | | .002 (.097) | .003 (.139) | .002 (.097) | .003 (.135) |
| Org. involvement | | .076 (.057) | .094 (.070) | .076 (.057) | .092 (.068) |
| Task conscientiousness | Task conscientiousness | .586 (.061) ** | .560 (.062) ** | .586 (.061) ** | .614 (.069) ** |
| PE | | .255 (.096) ** | .158 (.059) ** | .255 (.096) ** | .160 (.059) ** |
| Task improvement | Task improvement | .702 (.060) ** | .637 (.059) ** | .702 (.060) ** | .656 (.057) ** |
| PE | | .075 (.091) | .045 (.054) | .075 (.091) | .041 (.050) |
| Group collaboration | Group collaboration | .624 (.062) ** | .612 (.060) ** | .624 (.062) ** | .533 (.058) ** |
| PE | | .120 (.049) * | .148 (.060) * | .120 (.049) * | .123 (.050) * |
| Group improvement | Group improvement | .697 (.045) ** | .711 (.041) ** | .697 (.045) ** | .656 (.048) ** |
| PE | | .144 (.070) * | .106 (.051) * | .144 (.070) * | .097 (.047) * |
| Org. involvement | Org. involvement | .717 (.044) ** | .726 (.040) ** | .717 (.044) ** | .673 (.044) ** |
| PE | | .141 (.062) * | .119 (.052) * | .141 (.062) * | .108 (.048) * |

Notes. PE: Psychological empowerment; *b*: unstandardized coefficient; *ß* : standardized coefficient; S.E.: Standard error of the estimate **: $p < .01$; *: $p < .05$.

**Table 5**. Exploratory analyses: cross-lagged estimates between variables for predictive models based on a single dimension of psychological empowerment (PE) at a time.

| | | *Time 1 → Time 2* | | *Time 2 → Time 3* | |
|---|---|---|---|---|---|
| *Predictor* | *Outcome* | *b (S.E.)* | *ß (S.E.)* | *b (S.E.)* | *ß (S.E.)* |
| | PE (Meaning) | | | | |
| Task conscientiousness | | .161 (.074)* | .158 (.073)* | .161 (.074)* | .168 (.076)* |
| Task improvement | | -.115 (.078) | -.109 (.075) | -.115 (.078) | -.124 (.084) |
| Group collaboration | | -.122 (.256) | -.063 (.133) | -.122 (.256) | -.065 (.135) |
| Group improvement | | .044 (.156) | .040 (.140) | .044 (.156) | .040 (.140) |
| Org. involvement | | .065 (.092) | .048 (.067) | .065 (.092) | .049 (.069) |
| | PE (Competence) | | | | |
| Task conscientiousness | | .038 (.052) | .052 (.073) | .038 (.052) | .052 (.072) |
| Task improvement | | .012 (.057) | .016 (.078) | .012 (.057) | .017 (.082) |
| Group collaboration | | -.160 (.179) | -.121 (.135) | -.160 (.179) | -.117 (.129) |
| Group improvement | | -.046 (.118) | -.059 (.150) | -.046 (.118) | -.055 (.141) |
| Org. involvement | | .135 (.066) * | .143 (.069) * | .135 (.066) * | .135 (.065) * |
| | PE (Self-determination) | | | | |
| Task conscientiousness | | .057 (.049) | .082 (.070) | .057 (.049) | .080 (.068) |
| Task improvement | | .024 (.057) | .034 (.080) | .024 (.057) | .035 (.082) |
| Group collaboration | | -.136 (.159) | -.104 (.120) | -.136 (.159) | -.095 (.110) |
| Group improvement | | -.076 (.100) | .100 (.131) | -.076 (.100) | -.091 (.119) |
| Org. involvement | | .143 (.069) * | .155 (.074) * | .143 (.069) * | .144 (.067) * |
| | PE (Impact) | | | | |
| Task conscientiousness | | .065 (.060) | .090 (.083) | .065 (.060) | .088 (.081) |
| Task improvement | | -.010 (.061) | -.014 (.083) | -.010 (.061) | -.015 (.086) |
| Group collaboration | | -.053 (.187) | -.038 (.133) | -.053 (.187) | -.036 (.126) |
| Group improvement | | -.004 (.105) | -.004 (.129) | -.004 (.105) | -.004 (.119) |
| Org. involvement | | .127 (.061)* | .135 (.065)* | .127 (.061)* | .125 (.059)* |
| | Task conscientiousness | | | | |
| PE (Meaning) | | .140 (.056) * | .139 (.055) * | .140 (.056) * | .142 (.054) * |
| PE (Competence) | | .132 (.077) | .100 (.058) | .132 (.077) | .095 (.055) |
| PE (Self-determination) | | .175 (.071) * | .116 (.046) * | .175 (.071) * | .121 (.048) * |
| PE (Impact) | | .133 (.069) | .101 (.052) | .133 (.069) | .096 (.049) |
| | Task improvement | | | | |
| PE (Meaning) | | .053 (.056) | .051 (.054) | .053 (.056) | .047 (.049) |
| PE (Competence) | | -.145 (.083) | -.106 (.060) | -.145 (.083) | -.089 (.073) |
| PE (Self-determination) | | .020 (.073) | .013 (.047) | .020 (.073) | .012 (.044) |
| PE (Impact) | | .142 (.080) | .104 (.058) | .142 (.080) | .089 (.051) |
| | Group collaboration | | | | |
| PE (Meaning) | | .036 (.030) | .071 (.058) | .036 (.030) | .060 (.050) |
| PE (Competence) | | -.018 (.041) | -.026 (.059) | -.018 (.041) | -.020 (.047) |
| PE (Self-determination) | | .079 (.042) | .103 (.056) | .079 (.042) | .090 (.048) |
| PE (Impact) | | .134 (.042) ** | .204 (.067) ** | .134 (.042) ** | .163 (.053) ** |
| | Group improvement | | | | |
| PE (Meaning) | | .083 (.048) | .096 (.035) | .083 (.048) | .089 (.050) |
| PE (Competence) | | .033 (.061) | .029 (.053) | .033 (.061) | .024 (.045) |
| PE (Self-determination) | | .109 (.063) | .085 (.049) | .109 (.063) | .080 (.046) |
| PE (Impact) | | .164 (.057) ** | .148 (.053) ** | .164 (.057) ** | .128 (.045) ** |
| | Org. involvement | | | | |
| PE (Meaning) | | .068 (.041) | .093 (.055) | .068 (.041) | .087 (.052) |
| PE (Competence) | | .073 (.052) | .076 (.052) | .073 (.052) | .065 (.045) |
| PE (Self-determination) | | .137 (.054) * | .126 (.049) * | .137 (.054) * | .119 (.047) * |
| PE (Impact) | | .181 (.053) ** | .189 (.054) ** | .181 (.053) ** | .163 (.047) ** |

Notes. **: $p < .01$; *: $p < .05$.

## Appendix A. Formal Presentation of the Autoregressive Cross Lagged Model

*Note: These supplemental appendices could appear either directly with the published version of the manuscript if deemed useful by the editorial board, or on the journal website hot-linked to the published article if such a possibility is available, or on one of our own personal websites, or as availab le upon request from the authors. We would appreciate editorial advice on this matter.*

To illustrate an autoregressive cross-lagged model (for additional technical details, see Jöreskog, 1979; Marsh & Yeung, 1998; Morin, Maïano et al., 2011), it is easier to start with a simple case with two latent variables, Y and X, that have been measured repeatedly over time (*t*) on *i* participants. The models estimated in the current studies are only logical extensions of this simpler model. In strict univariate autoregressive models, each variable at time t is expressed as an additive function of its preceding value at Time *t*-1 and a random error term. Thus, for $t > 1$, the equation for $y_{it}$ is:

$$y_{it} = \alpha_{yt} + \rho_{y_t, y_{t-1}} y_{i,t-1} + \varepsilon_{yit} \quad (1)$$

In this equation, $y_{it}$ is the dependent variable for participant *i* at time *t*, $\alpha_{yt}$ is the fixed intercept for the equation at time *t*, $\rho_{y_t, y_{t-1}}$ is the regression weight representing the autoregressive effects of $y_{it}$ on $y_{it-1}$, which may change over time, and $\varepsilon_{yit}$ is the error term. This model assumes that errors have a mean of 0, are not correlated over time, across cases or with the *y*s. In this model, since no predictor is available for the first measurement point, the equation for $y_{i1}$ is:

$$y_{i1} = \alpha_{y1} + \varepsilon_{yi1} \quad (2)$$

Since it is possible to model autoregressive functions for multiple variables, it is also possible to specify relationships between those variables. In multivariate autoregressive cross-lagged models, each variable is expressed as an additive function of the preceding values on both variables (Y and X) and a random error term. More precisely, for $t > 1$, the equations for $y_{it}$ and $x_{it}$ are:

$$y_{it} = \alpha_{yt} + \rho_{y_t, y_{t-1}} y_{i,t-1} + \rho_{y_t, x_{t-1}} x_{i,t-1} + \varepsilon_{yit} \quad (3)$$

$$x_{it} = \alpha_{xt} + \rho_{x_t, y_{t-1}} y_{i,t-1} + \rho_{x_t, x_{t-1}} x_{i,t-1} + \varepsilon_{xit} \quad (4)$$

In these equations $\rho_{y_t, x_{t-1}} x_{i,t-1}$ and $\rho_{x_t, y_{t-1}} y_{i,t-1}$ are respectively the regression weights representing the cross lagged effects of $y_{it}$ on $x_{it-1}$ and of $x_{it}$ on $y_{it-1}$. Multivariate models assume that errors have a mean of 0, are not correlated over time, across cases, across processes, with the *y*s or with the *x*s, although in many cases, such as in the present study, errors are allowed to correlate across processes within time points to reflect the fact that what caused a disturbance at a specific time point on a variable may also have caused a similar disturbance on the other variable (i.e. $\varepsilon_{yit}$ may correlate with $\varepsilon_{xit}$). In this model, y and x are treated as predetermined as in equation (2) for the first measurement point since no predictor is available for $y_{i1}$ or for $x_{i1}$.This simplified version of the model is illustrated in the supplemental Figure, excluding the measurement part of the model and including only two repeated variables for greater simplicity of illustration.

The first model estimated in the present study included a total of 6 latent variables measured three times (t = 1, 2, 3). These six latent variables include the higher-order PE factor, and the 5 first-order BI factor, hereafter referred to as BX with the X representing the subscale (X = 1, 2, 3, 4, 5). Thus, the autoregressive specification of this model was specified for PE as:

$$PE_{it} = \alpha_{PEt} + \rho_{PE_t, y_{t-1}} PE_{i,t-1} + \varepsilon_{PEit} \quad (5)$$

and $PE_{i1} = \alpha_{PE1} + \varepsilon_{PEi1}$ (6)

and for BX as: $BX_{it} = \alpha_{BXt} + \rho_{BX_t, BX_{t-1}} BX_{i,t-1} + \varepsilon_{BXit}$ (7)

and $BX_{i1} = \alpha_{BX1} + \varepsilon_{BXi1}$ (8)

where the errors have a mean of 0, are not correlated over time, across cases or with the *y*s, but are correlated across process within time. This specification of the errors holds for all subsequent models. The addition of the cross lagged relations changed equations (5) and (7), with equations (6) and (8) remaining unchanged, and no cross lagged relations specified between the five BX subscales:

$$PE_{it} = \alpha_{PEt} + \rho_{PE_t, PE_{t-1}} PE_{i,t-1} + \rho_{PE_t, B1_{t-1}} B1_{i,t-1} + \rho_{PE_t, B2_{t-1}} B2_{i,t-1} + \rho_{PE_t, B3_{t-1}} B3_{i,t-1} + \rho_{PE_t, B4_{t-1}} B4_{i,t-1} + \rho_{PE_t, B5_{t-1}} B5_{i,t-1} + \varepsilon_{PEit} \quad (9)$$

$$BX_{it} = \alpha_{BXt} + \rho_{BX_t, BX_{t-1}} BX_{i,t-1} + \rho_{BX_t, PE_{t-1}} PE_{i,t-1} + \varepsilon_{BXit} \quad (10)$$

The second model estimated in the present study included a total of 3 latent variables measured three times (t = 1, 2, 3). These three latent variables include the higher-order PE factor, the higher-order Extra-Role (ER) factor, and first-order In-Role factor (IR). Thus, the autoregressive specification of this model was specified for PE remains as specified in equation (5) and (6), while the autoregressive part of the model for ER and IR is specified as:

$$IR_{it} = \alpha_{IRt} + \rho_{IR_t, IR_{t-1}} IR_{i,t-1} + \varepsilon_{IRit} \quad (11)$$

$$IR_{i1} = \alpha_{IR1} + \varepsilon_{IRi1} \quad (12)$$

$$ER_{it} = \alpha_{ERt} + \rho_{ER_t, ER_{t-1}} ER_{i,t-1} + \varepsilon_{ERit} \quad (13)$$

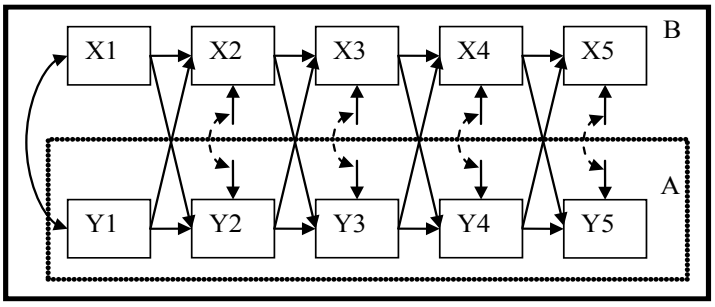
$$ER_{i1} = \alpha_{ER1} + \varepsilon_{ERi1} \quad (14)$$

Then, the addition of the cross lagged part of the model changed equations (5), (11) and (13) in the following manner, with equations (6), (12) and (14) remaining unchanged, and no cross lagged relations specified between IR and ER:

$$PE_{it} = \alpha_{PEt} + \rho_{PE_t, PE_{t-1}} PE_{i,t-1} + \rho_{PE_t, IR_{t-1}} IR_{i,t-1} + \rho_{PE_t, ER_{t-1}} ER_{i,t-1} + \varepsilon_{PEit} \quad (15)$$

$$IR_{it} = \alpha_{IRt} + \rho_{IR_t, IR_{t-1}} IR_{i,t-1} + \rho_{IR_t, PE_{t-1}} PE_{i,t-1} + \varepsilon_{IRit} \quad (16)$$

$$ER_{it} = \alpha_{ERt} + \rho_{ER_t, ER_{t-1}} ER_{i,t-1} + \rho_{ER_t, PE_{t-1}} PE_{i,t-1} + \varepsilon_{ERit} \quad (17)$$




*Supplemental Figure*. Univariate (A) and Bivariate (B) Autoregressive Cross-Lagged Model.