

Basic psychological needs and work motivation: A longitudinal test of directionality

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Abstract Most work-related studies of self-determination theory (SDT) have focused either on satisfaction of basic psychological needs or on types of work motivation when studying motivational processes at work. The few studies that have considered both mechanisms have usually assumed that satisfaction or frustration of basic psychological needs is a prerequisite of different types of work motivation. Nevertheless, the directionality of this relation has not been explicitly tested in previous studies of the workplace. The current study explored the relations among managerial need support, basic psychological need satisfaction at work, and work motivation. It tested competing sets of hypotheses regarding the directionality of these three core constructs within SDT's model of work motivation. A longitudinal analysis suggested that managerial need support was positively directly related to basic psychological need satisfaction but not directly related to work motivation. Further, results indicated that basic psychological need satisfaction was related to work motivation over time and not the other way around. In addition, it was found an indirect relation between in managerial need support and in work motivation through in basic psychological need satisfaction. These findings have important implications for future SDT research testing process models in the workplace.

Keywords Self-determination theory · Managerial need support · Basic psychological need satisfaction · Work motivation · Longitudinal

Introduction

Self-determination theory (SDT; Deci and Ryan 2000; Ryan and Deci 2017) is a theory of human motivation, personality, and well-being that is applicable across many life domains. The 2005 article by Gagné and Deci (2005) was the first to provide an extensive application of SDT within the work literature. Subsequently, the research literature emphasizing SDT in the study of motivational processes in the work domain has increased substantially. Recently, Deci et al. (2017) reviewed the work-related SDT literature, pointing to an impressive number of work-related SDT articles in the last two decades. Moreover, Olafsen (2016) pointed to over 150 SDT-based publications using the core concepts of basic psychological needs and/or motivational regulations to explain motivational processes in the work domain.

The research literature on SDT in the work domain has used social-contextual and individual-differences variables as antecedents and moderators that have implications for the motivational process at work. In addition, the literature has shown implications of the motivational process at work for both performance and well-being outcomes across occupations, cultures, and demographics. Typically, this research has used either basic psychological needs or types of motivational regulations (e.g., autonomous or controlled) as process variables. Only a few studies have considered both concepts, with the motivation variables being predicted from the basic psychological needs (e.g., De Cooman et al. 2013; Olafsen et al. 2015; Trépanier et al. 2015). However, the implicit directionality between these concepts has merely

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been assumed, not explicitly tested. Given that both basic psychological needs and work motivation have shown strong direct implications on outcomes in various work studies, it seems important to test the directionality of the assumed SDT process model of work motivation. In particular, SDT identified both different types of motivation that regulate and direct behavior and basic psychological needs that energize behavior and play some role in direction of behavior. An important theoretical question that has not been addressed empirically is whether, over time, (1) need satisfaction promotes autonomous motivation, (2) autonomous motivation promotes need satisfaction, or (3) each promotes the other. If need satisfaction promotes autonomous motivation, but not vice versa, it may provide a handle for how to promote autonomous motivation and the positive outcomes that follow from it. Specifically, the handle would be that authority figures relate to others (e.g., children, students, employees, patients) in ways that facilitate satisfaction of their three basic psychological needs, although that would also require showing that basic need support predicts need satisfaction directly. If the association goes only in the other direction, from autonomous motivation to basic need satisfaction, it would suggest that the focus toward promoting positive outcomes would begin by facilitating autonomous motivation in whatever way accomplishes that, presumably need support. Hence, the purpose of the current study is to explore the directionality among the core SDT concepts of need support, need satisfaction, and work motivation.

Self-determination theory

Self-determination theory is a macro theory of motivation with six mini-theories that explain different aspects of human motivation, five of which are directly relevant to the workplace. Over the years, these different mini-theories have been developed and refined through empirical investigation across different domains, cultures, and demographics. Moreover, empirical research has shown the links between the different mini-theories and, as such, a motivational process model has become evident. In the current study, the mini-theories focusing on the social-contextual climate, basic psychological needs, and types of motivational regulation are the focus.

Initially SDT was concerned with the effects of social-contextual climates on intrinsic motivation, which were said to happen through the mechanisms of changes in perceived locus of causality and changes in perceived competence. In cognitive evaluation theory (CET)—SDT's first mini-theory—a distinction was made between informational and controlling social contexts, with informational climates providing effectance-endorsing inputs and an internal locus of causality. Controlling climates on the other hand, are those

that pressure people towards specified outcomes conducing toward a shift from a more internal to external perceived locus of causality that is frequently accompanied by a decrease in perceived competence (Ryan and Deci 2002).

The implications of the social contextual climate takes us to the unifying principle of basic psychological needs within SDT. Basic psychological needs are seen as inherent psychological nutrients that are essential for ongoing psychological growth, integrity, and well-being (Deci and Ryan 2000). Basic psychological needs theory (BPNT), one of SDT's mini-theories, specifies three such psychological needs based on two decades of empirical research—the need for autonomy and the need for competence, the importance of which emerged from the research on intrinsic motivation, and the need for relatedness, the importance of which became clear from the research on internalization of extrinsic motivation. The need for autonomy (deCharms 1968) refers to the feeling of choice and concurrence with one's actions; the need for competence (White 1959) refers to the feeling of being effective and capable; and the need for relatedness (Baumeister and Leary 1995) refers to the feeling of a connection to, caring for, and being cared for by other individuals and groups. Satisfaction of these basic needs are associated with well-being and optimal functioning (Vansteenkiste and Ryan 2013).

Another important concept within SDT is a differentiated view of motivation. Whereas the majority of motivational theories view motivation as a unitary concept that varies in amount, SDT emphasized different types of motivation that relate to different quality outcomes. One important distinction within SDT and some other theories of work motivation is between intrinsic and extrinsic motivation. Intrinsic motivation refers to motivation that stems from interest and enjoyment in the activity itself. With intrinsic motivation, people are not primarily concerned with separable outcomes for engaging in an activity or doing the activity well. Rather, they engage in the activity because they find it interesting and enjoyable. Extrinsic motivation, on the other hand, is motivation that stems from engaging in an activity for the sake of a separable outcome or contingency. For example, they may engage in the activity to obtain some form of reward or because they want to avoid punishment for not engaging it. What distinguishes SDT from the other theories that acknowledge intrinsic and extrinsic motivation is that it considers different types of extrinsic motivation. This seems especially fruitful in a domain such work, where all tasks are not necessarily intrinsically motivating, and yet relying simply on external contingencies has not worked effectively for promoting high-quality performance and well-being (Cerasoli et al. 2014).

Within organismic integration theory (OIT)—another mini-theory—SDT considers four different types of extrinsic motivation that vary in their degree of relative autonomy.

External regulation is comparable with the traditional view of extrinsic motivation by referring to motivation that stems from engaging in an activity to obtain a reward or to avoid punishment. *Introjected regulation* is motivation that stems from wanting to comply with internal rather than external demands. Such motivation, thus, comes from wanting to feel proud for doing the task or to avoid feeling guilt or shame for not engaging in it. *Identified regulation* is behavior done because the value and relevance of the activity is understood and accepted as one's own—that is, one engage in the activity because one perceives it of personal value and importance. Finally, *integrated regulation* is where the activity or behavior is fully self-endorsed and consistent with other values and belief in one's life. Both external regulation and introjection are assumed to have an external perceived locus of causality, and are therefore labeled controlled forms of motivation within SDT. On the other hand, identified and integrated regulations, along with intrinsic motivation, are said to be linked to an internal perceived locus of causality and, hence, are labeled autonomous forms of motivation within this framework.

Through these three mini-theories, SDT can be used as a framework to explain how and why social-contextual factors have implications on human behavior and functioning. That is, satisfaction of the three basic psychological needs for autonomy, competence, and relatedness is seen as essential for individuals' effective and healthy functioning in terms of their well-being, attitudes, and behavior. Informational environments are need supportive, thus facilitating need satisfaction, intrinsic motivation, and the internalization process of extrinsic motivation. Controlling environments, on the other hand, may cause need frustration and set pressure towards controlled motivation. In the next section, we review this framework as it has been applied to research in the work domain.

Self-determination theory in the work literature

Various social contextual antecedents such as leadership and social climate, compensation, and job characteristics have been found to have implications for the motivational processes at work (for a review, see Deci et al. 2017). With respect to social climate, a number of studies have shown that need-supportive (rather than need-thwarting) managers promote need satisfaction (e.g., Baard et al. 2004) and autonomous work motivation (e.g., Williams et al. 2014). Another example is a research stream related to the job demands-resources (JD-R) model that has used the basic psychological needs and, to some extent, the differentiation of types of motivational regulation as mechanisms to explain the relation between various job characteristics and work outcomes. This literature typically point to the beneficial implications of various job resources (e.g., task autonomy,

skill utilization and positive feedback) as well as job challenge demands (e.g., workload and cognitive demands) on basic psychological need satisfaction (e.g., Olafsen and Halvari 2017; Van den Broeck et al. 2008), while job hindrance demands (e.g., role conflict and emotional demands) are negatively associated with satisfaction of the basic psychological needs (e.g., Albrecht 2015).

Further, SDT research has found various implications of motivation variables for both performance-related outcomes and well-being related outcomes in the workplace. For instance, autonomous work motivation has been linked to both self-reported (e.g., Olafsen and Halvari 2017) and manager-reported performance (e.g., Baard et al. 2004), knowledge sharing (Foss et al. 2009), and organizational citizenship behavior (Güntert 2015). As for indicators of employee well-being, there exists a large literature that shows positive consequences for both need satisfaction and autonomous motivation on well-being, and negative consequences for both need frustration and controlled motivation. For instance, Baard et al. (2004) found that satisfaction of the basic psychological needs was related to better psychological adjustment, and in a study by Graves and Luciano (2013) autonomous work motivation was positively linked to vitality. On the other hand, a recent study by Olafsen et al. (2017) showed that need frustration related to more experienced stress at work, which in turn had a large range of negative outcomes in terms of somatic symptoms, emotional exhaustion, turnover intentions, and absenteeism. Finally, controlled motivation has also been related to negative outcomes, for instance, in terms of exhaustion (Fernet et al. 2012), and psychological distress and complaints (Trépanier et al. 2015).

The present study—a process model

The current study sought to identify the directionality between core constructs within SDT, namely managerial need support, basic psychological need satisfaction, and autonomous work motivation. Regarding managerial need support, research is pretty consistent in looking at this as a social-contextual factor affecting employees' basic psychological needs (e.g., Baard et al. 2004) and motivational work regulation (e.g., Williams et al. 2014). Indeed, also experimental studies point to managerial need support as an important antecedent of the motivational processes at work. For instance, one of the first work-related SDT studies was that by Deci et al. (1989), who performed an intervention in a Fortune 500 company, in which managers were trained to be more need-supportive. The results showed that managers in the intervention group became more need-supportive and that this positively affected the employees who reported greater job satisfaction and trust in the corporate management. A more recent intervention study showed similar

results, as managers trained in SDT principles evidenced more need support at the post-training assessment than managers who did not receive such training, and the employees of the trained managers were more autonomously motivated and engaged in their work after the training period (Hardré and Reeve 2009). Together, these interventions suggest that need support is an important motivational antecedent in the workplace.

Considering the concepts of basic psychological need satisfaction and motivational regulation at work, most SDT studies have included, as mentioned, either one or the other in their theoretical and empirical models. Together the research reviewed above shows that social-contextual variables relate to both basic psychological need satisfaction and motivational work regulations, and that both basic psychological need satisfaction and motivational work regulations have important implications on two broad work outcomes—performance and employee wellness. However, of the large SDT work literature, only a few studies have examined the motivational processes at work by looking into both the basic psychological needs and motivational regulations (Aryee et al. 2015; Bentzen et al. 2015; De Cooman et al. 2013; Graves and Luciano 2013; Olafsen and Halvari 2017; Olafsen et al. 2015; Trépanier et al. 2015). For instance, De Cooman et al. (2013) looked at the path from job characteristics to work effort through basic psychological need satisfaction and autonomous work motivation. In this study, job characteristics were related to need satisfaction that, in turn, was related to autonomous work motivation. Autonomous work motivation was, in turn, related to work effort. Similar relations were studied in Olafsen and Halvari (2017) and Trépanier et al. (2015).

In De Cooman et al. (2013), direct relations between job characteristics and motivation were found, as well as a direct link from need satisfaction to work effort. In Olafsen and Halvari (2017), alternative models where job characteristics predicted autonomous work motivation directly were tested in a similar way, but in this study such direct relations were not detected. In Graves and Luciano (2013), both satisfaction of basic psychological needs and autonomous motivation were related to outcome variables (i.e., vitality and affective commitment), while in Aryee et al. (2015), intrinsic motivation only predicted job performance when a direct relation between need satisfaction and performance was not included. In the model accounting for both relations, neither need satisfaction nor intrinsic motivation related significantly to job performance. Finally, in Bentzen et al. (2015), the SDT process model was examined using change scores, where it was shown that change in contextual variables (i.e., workload and perceived autonomy support) predicted change in satisfaction of the basic needs, which in turn predicted change in motivational regulation and subsequently change in

work-related well-being. Also in this study, direct relations from change in basic need satisfaction to change in outcome variables were shown.

In sum, the studies considering both basic psychological needs and type of work motivation have reported both direct and indirect relations from contextual variables to these motivational mechanisms and both direct and indirect relations from these mechanisms to various outcomes. At the same time, they have not directly discussed or tested the directionality of this motivational process, nevertheless assumed that basic psychological needs precedes motivational regulations at work. Moreover, the majority of these studies are cross-sectional, meaning that the order of variables is hard to determine. That is to say, we do not disagree that the basic psychological needs could be the first in line, but we find it important to contribute to establishing the order of constructs within the SDT motivational model at work.

Studies and theoretical models specifying the order in which satisfaction of the basic psychological needs foster motivational regulation evolved initially from research showing that the promotion of need satisfaction, especially the competence and autonomy needs, facilitated intrinsic motivation, which was the initial type of autonomous motivation in SDT (Deci and Ryan 1980). Subsequent research showed further that promotion of psychological need fulfillment promoted internalization and integration of extrinsic motivation, which underlies another type of autonomous motivation. So it makes sense that the order of need satisfaction promoting autonomous motivation is reasonable. However, it is also plausible that being autonomously motivated to engage in activities could facilitate need satisfaction, as acting autonomously would satisfy the autonomy need. As well when people act volitionally they are likely to act in ways that satisfy their competence and relatedness needs as well. Further, there is substantial research showing that need support from the social context facilitates both need satisfaction and autonomous motivation in studies that use need support and one or the other of the motivational concepts (e.g., Deci et al. 2017). Accordingly, an empirical investigation of the order of these motivational concepts in a process model seems worthy, and the above considerations result in six competing pairs of hypotheses regarding the relations among managerial need support, basic psychological need satisfaction, and work motivation each representing an alternative process model.

Hypothesis 1a Managerial need support and change in managerial need support will relate directly positively to change in basic psychological need satisfaction.

Hypothesis 1b Basic psychological need satisfaction and change in basic psychological need satisfaction will

relate directly positively to change in autonomous work motivation.

Hypothesis 1c Managerial need support and change in managerial need support will relate indirectly positively to change in autonomous work motivation through change in basic psychological need satisfaction.

Hypothesis 2a Managerial need support and change in managerial need support will relate directly positively to change in autonomous work motivation .

Hypothesis 2b Autonomous work motivation and change in autonomous work motivation will relate directly positively to change in basic psychological needs satisfaction.

Hypothesis 2c Managerial need support and change in managerial need support will relate indirectly positively to change in basic psychological need satisfaction through change in autonomous work motivation.

Hypothesis 3a Basic psychological need satisfaction and change in basic psychological need satisfaction will relate directly positively to change in managerial need support.

Hypothesis 3b Managerial need support and change in managerial need support will relate directly positively to change in autonomous work motivation.

Hypothesis 3c Basic psychological need satisfaction and change in basic psychological need satisfaction will relate indirectly positively to change in autonomous work motivation through change in basic psychological need satisfaction.

Hypothesis 4a Basic psychological need satisfaction and change in basic psychological need satisfaction will relate directly positively to change in autonomous work motivation.

Hypothesis 4b Autonomous work motivation and change in autonomous work motivation will relate directly positively to change in managerial need support.

Hypothesis 4c Basic psychological need satisfaction and change in basic psychological need satisfaction will relate indirectly positively to change in managerial need support through change in autonomous work motivation.

Hypothesis 5a Autonomous work motivation and change in autonomous work motivation will relate directly positively to change in managerial need support.

Hypothesis 5b Managerial need support and change in managerial need support will relate directly positively to change in basic psychological need satisfaction.

Hypothesis 5c Autonomous work motivation and change in autonomous work motivation will relate directly positively to change in basic psychological need satisfaction through change in managerial need support.

Hypothesis 6a Autonomous work motivation and change in autonomous work motivation will relate directly positively to change in basic psychological needs satisfaction.

Hypothesis 6b Basic psychological need satisfaction and change in basic psychological need satisfaction will relate positively to change in managerial need support.

Hypothesis 6c Autonomous work motivation and change in autonomous work motivation will relate indirectly positively to change in managerial need support through change in basic psychological needs satisfaction.

Methods

Participants and procedures

Data were taken from the project “Stuck between a rock and a hard place—unit leaders of the health care service in Norwegian municipalities’ experiences of needs support, availability of resources, role conflict, and motivation at work: links to leaders’ health and competence development, and to unit health goal attainment. A Longitudinal Study” (Olafsen 2017; Olafsen et al. 2017), where the participants were unit leaders of Norwegian municipal health care institutions. An invitation to an electronic survey was distributed to all 428 municipalities in Norway in December 2011 with a request to send the invitation to the study to all health care leaders in the municipality. The invitation contained information about the purpose of the study, and that participation was voluntary and confidential. The subsequent data collections were conducted in May 2012, November 2012, and February 2013. In the first data collection, 267 unit leaders participated. In the following data collections, 185, 152, and 115 of these unit leaders participated, respectively. Demographics for the sample across the four data collections are presented in Table 1.

Measures

Managerial need support

Need support from immediate management was reported on the 6-item version of the Work Climate Questionnaire (Baard et al. 2004). A sample item is “I feel that my manager

Table 1 Participant demographics across the 15-month study period

	Time 1	Time 2	Time 3	Time 4
Number of respondents	267	185	152	115
Gender				
Female: 205	Female: 141	Female: 116	Female: 88	
Male: 60	Male: 42	Male: 34	Male: 26	
Unspecified: 2	Unspecified: 2	Unspecified: 2	Unspecified: 1	
Age				
29 or younger: 2	29 or younger: 2	29 or younger: 2	29 or younger: 2	
30–39: 33	30–39: 19	30–39: 13	30–39: 7	
40–49: 89	40–49: 61	40–49: 49	40–49: 39	
50–59: 109	50–59: 78	50–59: 67	50–59: 52	
60 or older: 33	60 or older: 24	60 or older: 20	60 or older: 14	
Unspecified: 1	Unspecified: 1	Unspecified: 1	Unspecified: 1	
Urban or rural municipality				
Urban: 114	Urban: 85	Urban: 73	Urban: 59	
Rural: 151	Rural: 99	Rural: 78	Rural: 55	
Unspecified: 2	Unspecified: 1	Unspecified: 1	Unspecified: 1	
Unit				
Home-based care: 117	Home-based care: 84	Home-based care: 69	Home-based care: 55	
Institution: 96	Institution: 62	Institution: 52	Institution: 38	
Unspecified: 54	Unspecified: 39	Unspecified: 31	Unspecified: 22	

provides me choices and options”. The items were reported on a scale ranging from 1 (completely disagree) to 7 (completely agree).

Basic psychological need satisfaction

The work-related basic needs scale (Van den Broeck et al. 2010) was used to assess satisfaction of the three basic psychological needs. Autonomy satisfaction (3 items; e.g., “The tasks I have to do at work are in line with what I really want to do”), competence satisfaction (3 items; e.g., “I really master my tasks at my job”), and relatedness satisfaction (3 items, e.g., “At work, I feel part of a group”) were reported on a scale ranging from 1 (totally disagree) to 5 (totally agree).

Autonomous work motivation

The Multidimensional Work Motivation Scale (Gagné et al. 2015) presented participants with the following stem: “I put effort into my job...”. Participants rated pre-selected responses that assessed identified regulation (3 items; e.g., Because putting efforts in this job has personal significance to me) and intrinsic motivation (3 items; e.g., Because what I do in my work is exciting). Responses were made on a 7-point scale from 1 (not at all for this reason) to 7 (exactly for this reason). The scores on identified

regulation and intrinsic motivation were added to make a composite for autonomous work motivation.

Missing data

Completers versus dropouts

Because only 115 of the 267 enrolled participants completed the study, differences in the study variables, age, gender, and type of work unit between groups (completers = 0; dropouts = 1) at Time 1 were assessed. Results from a logistic regression analysis showed that completion status was not associated with Time 1 measures of managerial need support ($OR = 1.11$, $SE = .14$, $p = .469$), need satisfaction ($OR = .73$, $SE = .42$, $p = .451$), autonomous motivation ($OR = .75$, $SE = .22$, $p = .194$), age ($OR = .80$, $SE = .17$, $p = .185$), gender ($OR = .176$, $SE = .39$, $p = .146$), or type of work unit ($OR = 1.35$, $SE = .31$, $p = .330$).

Amount and distribution of missing data

Table 2 presents information on item non-response and wave non-response. Missing value analysis on each study variable indicated that the data were missing completely at random ($MCAR [\chi^2 (df = 209) = 232.24, ns]$).

Data analyses

Given the complexity of the model relative to the sample size, the hypothesized model was tested using path analysis with composite variables in AMOS. The proposed model was estimated with Full Direct Maximum Likelihood (FIML) in order to impute the missing responses as recommended for SEM-analyses (Allison 2003; Graham 2009). Model fit was evaluated using the Chi square likelihood ratio (χ^2/df), the Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA). Acceptable model fit is indicated by a χ^2/df less than 3 (Gefen et al. 2000), and a CFI close to or higher than .95 accompanied by a RMSEA close to or lower than .08 (Hu and Bentler 1999). Age, gender, and type of unit (institution vs. home-based care) were used as auxiliary variables in the model estimation. These auxiliary variables were correlated with the study variables at Time 1 and with the error variances at Time 2, Time 3, and Time 4, as recommended by Enders (2006). Correlations between the Time 1 measures were specified. Given that the correlations between the study variables did not show a pure simplex pattern (see Table 3), autoregressive paths between each time point of the three study variables were added (Little 2013). In addition, as the process was assumed to be stationary (Cole and Maxwell 2003), the autoregressive- and cross-lagged paths were set equal to be able to test a more parsimonious model.

Results

Model testing

The test of the hypothesized model comprised managerial need support, basic psychological need satisfaction (i.e., composite of autonomy-, competence-, and relatedness satisfaction), autonomous work motivation (i.e., composite of identified regulation and intrinsic motivation). This model had an acceptable fit to the data: $\chi^2 (df=36) = 67.59$, $p = .001$, CFI = .97, and RMSEA = .057, 90% CI [.036, .078]. Based on a two-tailed test, the results showed that managerial need support at Times 1, 2 and 3, respectively were associated with basic psychological need satisfaction at work at Time 2 ($\beta = .14$, $p < .001$), Time 3 ($\beta = .13$, $p < .001$), and

Time 4 ($\beta = .13$, $p < .001$). Managerial need support at Times 1, 2 and 3, respectively were, however, not associated with autonomous work motivation at Time 2 ($\beta = .05$, $p = .155$), Time 3 ($\beta = .06$, $p = .155$), and Time 4 ($\beta = .06$, $p = .155$). Basic psychological need satisfaction at work at Times 1, 2 and 3, respectively were associated with autonomous work motivation at Time 2 ($\beta = .14$, $p = .002$), Time 3 ($\beta = .13$, $p = .002$), and Time 4 ($\beta = .14$, $p = .002$) but not with managerial need support at Time 2 ($\beta = .08$, $p = .079$), Time 3 ($\beta = .07$, $p = .079$), and Time 4 ($\beta = .08$, $p = .079$). Autonomous work motivation at Times 1, 2 and 3, respectively were not associated with basic psychological need satisfaction at work at Time 2 ($\beta = .06$, $p = .128$), Time 3 ($\beta = .06$, $p = .128$), and Time 4 ($\beta = .06$, $p = .128$) or with managerial need support at Time 2 ($\beta = .00$, $p = .934$), Time 3 ($\beta = .00$, $p = .934$), and Time 4 ($\beta = .00$, $p = .934$). The results are summarized in Fig. 1.

The indirect relations were tested with RMediation (Tofiqhi and MacKinnon 2011). The results showed an indirect relation from managerial need support to autonomous work motivation through basic psychological need satisfaction ($B = .014$; 95% CI [.004, .026]). Given the non-significant direct relation from managerial need support to autonomous work motivation, the non-significant direct relation from autonomous work motivation to basic psychological need satisfaction, the non-significant direct relation from autonomous work motivation to managerial need support or from basic psychological need support to managerial need support, no indirect relation from managerial need support to basic psychological need satisfaction through autonomous work motivation ($B = .001$; 95% CI [−.001, .005]), from autonomous work motivation to managerial need support through basic psychological need satisfaction ($B = .007$; 95% CI [−.003, .022]), from basic psychological need satisfaction to managerial need support through work motivation ($B = .001$; 95% CI [−.035, .035]), from basic psychological need satisfaction to autonomous work motivation through managerial need support ($B = .009$; 95% CI [−.004, .029]), or from autonomous work motivation to basic psychological need satisfaction through managerial need support ($B = .000$; 95% CI [−.006, .007]) was detected.

In sum, these results support hypotheses 1a, 1b, and 1c, while the competing sets of hypotheses were rejected based on the findings in the present study in the workplace. In

Table 2 Item non-response and wave non-response across the 15-month study period

Variable	Item non-response (of the composite variable)				Wave non-response			
	Time 1 (%)	Time 2 (%)	Time 3 (%)	Time 4 (%)	Time 1 (%)	Time 2 (%)	Time 3 (%)	Time 4 (%)
Need support	1.5	3.2	1.3	0.0	0.0	30.7	43.1	56.9
Need satisfaction	4.1	1.6	2.6	0.0	0.0	30.7	43.1	56.9
Autonomous motivation	4.5	4.3	3.9	0.0	0.0	30.7	43.1	56.9

Table 3 Descriptive statistics, alphas, and intercorrelations for the study variables

Variables	M	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. Need support _{T1}	5.63	1.18	.95															
2. Need support _{T2}	5.69	1.15	.51***	.95														
3. Need support _{T3}	5.47	1.31	.42***	.61***	.95													
4. Need support _{T4}	5.53	1.26	.41***	.52***	.72***	.95												
5. Need satisfaction _{T1}	3.90	.46	.47***	.33***	.36***	.31**	.76											
6. Need satisfaction _{T2}	3.87	.47	.40***	.49***	.33***	.38***	.70***	.77										
7. Need satisfaction _{T3}	3.92	.48	.38***	.47***	.48***	.38***	.58***	.65***	.81									
8. Need satisfaction _{T4}	3.92	.49	.31**	.35***	.36***	.53***	.59***	.70***	.63***	.81								
9. Autonomous motivation _{T1}	5.93	.79	.27***	.17*	.09	.18	.43***	.35***	.37***	.37***	.89							
10. Autonomous motivation _{T2}	5.78	.98	.27***	.33***	.20*	.31**	.37***	.45***	.43***	.44**	.67***	.91						
11. Autonomous motivation _{T3}	5.88	.90	.22**	.26**	.32***	.34***	.30***	.39***	.55***	.43***	.45***	.70***	.92					
12. Autonomous motivation _{T4}	5.99	.82	.30**	.33***	.30**	.42***	.37***	.47***	.58***	.53***	.56***	.60***	.60***	.91				

Alphas on the diagonal. Note Correlations based on non-imputed data

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

particular, it found support for a direct positive relation from managerial need support to basic psychological need satisfaction over a 15-month time period (1a), a direct positive relation from basic psychological need satisfaction to autonomous work motivation over time (1b), and an indirect positive relation from managerial need support to autonomous work motivation through basic psychological need support over time (1c).

Discussion

The purpose of this study was to examine the relations among managerial need support, basic psychological need satisfaction, and work motivation over time. In particular, the study was intended to determine the directionality among these three core constructs within the SDT framework in this work situation. The results of a four wave cross-lagged model showed support for a direct relation from change in managerial need support to change in basic psychological need satisfaction, and for a direct relation from change in basic psychological need satisfaction to change in autonomous work motivation. In addition, the results showed support for an indirect relation from change in managerial need support to change in autonomous work motivation through change in basic psychological need satisfaction. Given that the direct relation between change in managerial need support and change in autonomous work motivation was non-significant, there is implications of a full mediation between these two constructs through basic psychological need satisfaction. Alternative pathways did not receive any support. These results support a SDT process model where the paths go from managerial need support to basic psychological need satisfaction and, in turn, to autonomous work motivation. The theoretical and practical implications of these results will be presented in the following.

Theoretical implications

The results of the present study contribute to the literature on SDT in work organizations in two important ways. First, the study findings show longitudinal relations among core constructs within the SDT framework of work motivation. That is, managerial need support is shown to be associated with basic psychological need satisfaction, and, in turn, work motivation over time. These results add to a relatively scarce body of literature examining models of motivational processes at work that considers both basic psychological needs and motivational regulations for work activities. In addition, it lends support to studies that have examined these relation using cross-sectional designs. Indeed, these results support the hypothesis that when the manager is supportive of employees' basic psychological needs, more optimal forms

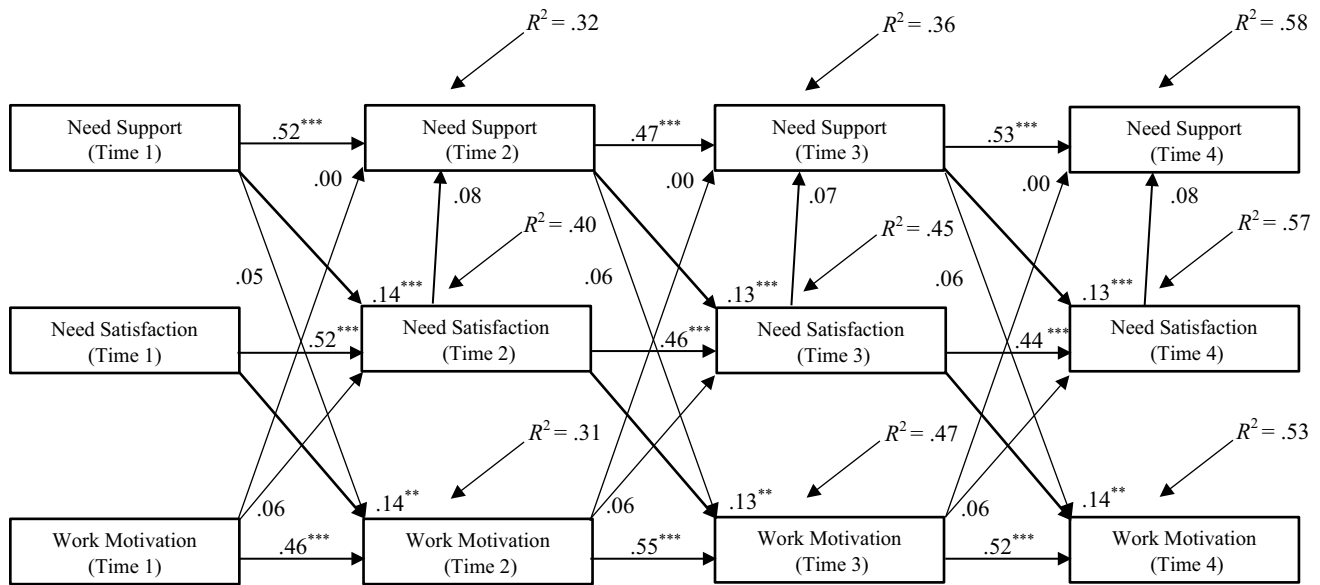


Fig. 1 Results of the path analysis with standardized parameter estimates, examining the longitudinal associations among managerial need support, basic psychological need satisfaction, and autonomous work motivation. *Note* For the sake of clarity, extra autoregressive

paths, control variables, and covariances among Time 1 measures and among error terms are not shown. * $p < .05$, ** $p < .01$, *** $p < .001$ (two-tailed)

of work motivation are prompted. The review of the current literature above indicates that this is something organizations would want considering how it leads to their employees being more productive as well as being psychologically well. Thus, the findings of the current study shed light on core constructs used to explain organizational behavior by finding support of a motivational process model at work that future studies can build on to examine both antecedents and outcomes of these processes relating to a variety of different work-related issues. This is an important contribution as the majority of the literature is based on cross-sectional studies that have limitations in this regard.

Second, and in extension, the main contribution of the present study is the longitudinal relations among managerial need support, basic psychological need satisfaction, and work motivation that implies something about the directionality between these core constructs of SDT, at least in this particular setting. That is, the literature on SDT in the work domain points to strong indications of need support on both basic psychological need satisfaction (and frustration) and type of work regulation, as well as consistent indications of the basic psychological needs and type of work motivation on various work-related outcomes, but has yet to address the directionality between the basic psychological needs and work motivation. As the current study provides support for a model where managerial need support predicts basic psychological need satisfaction and, in turn, work motivation rather than managerial need support directly predicting work motivation and in turn basic psychological need

satisfaction, the results highlight the importance of using the basic psychological needs as the psychological mechanism that explains how and why the social climate have implications on work motivation. This also points to a reason for including both concepts when studying motivational processes in the workplace. This does not, however, rule out the possibility that autonomous motivation does in fact enhance need satisfaction in some situations, as we argued earlier in the paper that it is quite plausible, indeed, even likely that when people are acting autonomously they will be providing themselves with need satisfaction. Additional research related to the questions examined in the current study would be useful, especially studies of moderators focused on the conditions in which autonomous motivation does predict basic psychological need satisfaction and those in which it does not.

In contrast to past research that has shown direct links from managerial need support to both basic psychological need satisfaction and work motivation, the results of the present study failed to show a direct significant link from need support to work motivation; only a significant link from need support to basic psychological need satisfaction was found. Given that the majority of past research has tended to look at either basic psychological need satisfaction or type of work motivation, this may explain these previous results. In particular, due to the fact that Table 3 shows significant bivariate correlations between need support and work motivation also in the current study, it may be the case that when one considers both basic

psychological need satisfaction and type of work motivation in the same model, need satisfaction acts as a full mediator in the relation between need support and motivation, and yet it might still be the case that there is a feedback loop from autonomous motivation to need satisfaction under some circumstances. As such, the current study must be viewed as a step in the process of exploring the relations among the three key concepts herein examined.

Thus, it is important to note that the results of the present study should be interpreted with the work context in mind. That is, at work the directionality between the basic psychological needs and work motivation supported in the present study could be explained by the fact that in this domain many employees are not intrinsically or autonomously motivated for their work jobs, so it would take significant need support resulting in need satisfaction to facilitate their autonomous motivation. In sports, for example, there is more reason to believe that people engage in a specific sport because of excitement and enjoyment of the sport in hand, thus leading to basic need satisfaction. Therefore, the directionality between the basic psychological needs and motivation supported in the present study would not necessarily be evident in all other domains. Future research could look into this.

Practical implications

The results of this study showed the importance of managers' role in fostering an optimal motivational process for their employees in line with a large range of previous research on the implications of managerial need support (Baard et al. 2004; Olafsen et al. 2015; Williams et al. 2014). In particular, it is essential that managers are able to take on the employee's perspectives, to understand how the employee views the situation, for instance by active listening and asking open questions. Furthermore, offering opportunities for choice and exploration, and encouraging self-initiation will give employees a voice in the decision-making process, enable them to try new approaches, make use of their skills, and be optimally challenged. Also of importance is to provide employees with a meaningful rationale that will help them understand the importance of the task (Deci et al. 1994). Finally, the managers' interpersonal involvement in terms of investing time and resources in providing the employees with social support and a feeling of belonging is essential (Deci and Ryan 1991). The results of the current study show that by providing such a need-supportive work environment, need satisfaction is fostered over time, which, in turn, manifests in autonomous work motivation. This is important as autonomous motivation in past research have been linked both to optimal performance and well-being among employees (Deci et al. 2017). This will benefit the organization in the long run.

Limitations and future research directions

Some limitations need to be taken into consideration when interpreting the results of the current study. The sample is one of convenience from a specific work population in the public sector in Norway. Hence, it is essential to be cautious about generalizing the results to work populations in general, and further research would be beneficial in replicating the results of the current study across different work samples. Another drawback is related to the longitudinal design of the study where quite a few respondents were lost during the 15-month study period. Although missing values indicated to be MCAR, dropouts did not relate to any study variable, and the analyses, hence, imputed missing values using FIML, analyses with a larger sample would be beneficial to evaluate the proposed relations with more power. In addition, although the sample size is acceptable in testing the present model with sum score variables (Cohen 1992), a bigger sample would also have enabled a test of the proposed model with latent variables where measurement error could have been taken into account. Lastly, although the longitudinal design indicates the directionality among the study variables, interventions are an important step in terms of establishing causality among these constructs. In that regard, the results are in line with previous intervention studies showing implications of increases in managers' need support on employee attitudes and motivation (Deci et al. 1989; Hardré and Reeve 2009), but future interventions could consider a fuller SDT process model when examining the motivational process that unfolds in the workplace. In addition, to uncover more details about the directionality between core concepts within SDT, future studies could include different work outcomes, for example, in the broad category of employee well-being and work performance to evaluate the directionality, direct and indirect links between such work outcomes and the core concepts within SDT of focus in the present study.

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Compliance with ethical standards

Conflict of interest The author declares that there are no conflict of interest.

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