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A within-person approach to the relation between quality of task motivation, performance and job satisfaction in everyday working life

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Abstract

Research generally shows that autonomous forms of motivation are associated with higher performance and job satisfaction, whereas controlled forms of motivation are linked to worse outcomes. These relationships are largely based on between-persons data from cross-sectional studies or longitudinal studies with few measurement points. However, motivation quality, performance, and job satisfaction can vary considerably from day to day and from task to task. It is unclear whether and how these experiences and behaviors covary over time within individuals at work in daily life. The present study assessed this using a diary approach. With a default protocol of 30 working days, an ecological momentary assessment application prompted 19 white-collar workers five times a day to report their autonomous and controlled motivation for work tasks and their productivity and job satisfaction at the end of each day. Fourteen participants gathered sufficient data to compute within-person relations and individual networks. At the between-person level, results were somewhat in line with prior survey-based research, whereas results at the within-person level present more nuanced findings and demonstrate that these will not inherently align with previous between-person findings. Individual network analyses indicated considerable interindividual heterogeneity, especially in the relationships between motivation and job satisfaction. In conclusion, these findings point to significant variability in the observed relations between task-related motivation, performance and job satisfaction in everyday life, and highlight the added value of a within person approach and individual networks in addition to between-persons approaches. The implications of these findings for occupational wellbeing research are discussed.

Keywords Task motivation · Productivity · Job satisfaction · Ecological momentary assessment · Within person

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Introduction

Employees' work motivation is of crucial importance to the success of organizations and societies, as well as to the well-being of individuals (Kanfer et al., 2017). While motivation is often conceptualized as a single quantity (i.e., one can be unmotivated, highly motivated or somewhere in between), Self-Determination Theory (SDT; Ryan & Deci, 2000) proposes that motivation can take on different quantities and qualities, which are predictive of behavior and outcomes across various contexts (Gagné et al., 2015; Ng et al., 2012). According to SDT, three motivational categories can be distinguished: amotivation, extrinsic motivation and intrinsic motivation (Ryan & Deci, 2000). When amotivated, an individual does not experience any motivation towards a task. Doing a task because one "wants to" because it is enjoyable, pleasurable or worthwhile, is called intrinsic motivation. As opposed to doing a task for mere instrumental reasons,

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because one "has to", which is called extrinsic motivation. These instrumental reasons for performing a task can range from avoiding punishment, to receiving rewards, boosting one's self-esteem or reaching a personally valued goal (Gagné et al., 2015). SDT subclassifies these instrumental reasons based on their degree of 'internalization', or the 'taking in' of a task which is formerly regulated by external factors, so that it becomes internally regulated (Ryan & Deci, 2000). These forms of extrinsic motivation are: *external regulation* (doing a task to obtain rewards or avoid punishment), *introjected regulation* (doing a task because it is pressured by internal forces, such as shame and guilt), and *identified regulation* (doing a task because one identifies with its value or meaning and accept it as one's own). In previous research, external and introjected regulations have often been combined in a composite score to represent *controlled motivation*; whereas identified and intrinsic motivation have been combined in a composite score representing *autonomous motivation* (e.g. Ketonen et al., 2018; Vansteenkiste et al., 2007).

Motivation, performance and job satisfaction

Distinguishing between different SDT-based qualities of motivation is relevant for common organizational behavior outcomes, including performance and job satisfaction (Deci et al., 2017, Van den Broeck et al., 2021). Meta-analytic results have shown that identified regulation is the strongest predictor of work performance (generally measured using self- or supervisor-reported in-role performance that focus on performing job-relevant tasks proficiently), followed by intrinsic motivation; controlled forms of motivation accounted for very little variance in performance (Van den Broeck et al., 2021). It is important to note that performance can have qualitative (e.g., creativity, production defects) and/or quantitative (e.g., count of production) properties. Although reviewing the research on performance in the context of SDT is beyond the scope of this paper (see for example Cerasoli et al., 2014; Deci et al., 2017), global work performance is likely both the presence of quantity and quality and the relative or total absence of counterproductive or antisocial work behaviors.

For job satisfaction, a similar pattern is often observed. Several survey-based studies indicate that autonomous is more strongly and positively related to job satisfaction than controlled motivation (Gagné et al., 2010; Millette and Gagné, 2008; Richer et al., 2002; Van den Broeck et al., 2021). As most studies mentioned in this section used a between-person approach, they inform why one person performs better at work or is more satisfied with it than others (between-person variation), for example. In contrast, to assess why one person performs better on some days than on other days (within-person variation), which may better inform to tailor motivation enhancing interventions, a within-person approach with a magnitude of measurements is needed. Furthermore, it is also important to note the 'level of abstractness' at which motivation, performance and job satisfaction are assessed. Whereas studies with few measurement timepoints and using a between-subjects typically assess people's motivation for their job in general, daily assessments (e.g. using diary approaches) are more likely to tap into motivation for (parts of) that day or a specific task. Daily assessments are likely to make people focus on different aspects of their job and hence result in different outcomes. This also has implications for how to measure daily performance and job satisfaction, and how workers might assess questions about their daily performance and job satisfaction. The next two sections discuss theory and research on (1) within-person variability in motivation, performance, and job satisfaction and (2) the 'level of abstractness' of assessing these constructs.

Within-person variability in motivation, performance, and job satisfaction

Theories of within-person performance variability converge on the contention that job performance is dynamic rather than static, underlining the relevance of a within-person approach to studying job performance (Dalal et al., 2014, 2020). In addition, motivation has been shown to exhibit considerable day-to-day variation (Lévesque and Brown, 2007). Whereas personality and affect have previously been shown to be relevant within-person antecedents of performance on a day-to-day basis (e.g., Debusscher et al., 2016; Judge et al., 2014; Merlo et al., 2018), to our knowledge, no daily diary studies have assessed the quality of motivation as a within-person antecedent of performance on a day-to-day basis.

Regarding job satisfaction, scholars have acknowledged that it too has a state-like component, in addition to a dispositional or enduring component (Ilies & Judge, 2002, 2004). Accordingly, studies have indicated that there is substantial day-to-day variation in job satisfaction experienced, which also impacts organizational behavior (Bowling et al., 2005). In applying a series of repeated measurements per individual and within-person analyses, Ilies and Judge (2002) found that over one third (36%) of the differences in summated means of reported job satisfaction (27 respondents, four times a day for 19 working days) could be ascribed to differences within individuals. Part of this variation has been ascribed to individual's affective state (Ilies et al., 2015). Yet, we presume that these daily fluctuations could also be induced by tasks that need to be done in the workplace and

an assessment of how motivated one is to perform these tasks.

Levels of abstractness when assessing motivation

Studying the association between task-related motivation and productivity or job satisfaction in day-to-day life at the event-level may potentially reveal different outcomes compared to previous between person approaches assessing motivation 'in general' (Gagné & Deci, 2005; Kuvaas et al., 2017). It is not self-evident that the associations of these constructs on the general level would translate into lower-time scale associations, as the general level evaluations are based on more encompassing evaluations rather than moment-to-moment granular tasks. Regarding motivation, this can be further explained by goal theory, as it is now well-accepted that goals are at the heart of motivation (Unsworth et al., 2011). According to goal hierarchy theory, goals exist in a hierarchy with higher-order, more abstract, long-term goals (values or identities) versus more concrete day-to-day task goals (Cropanzano et al., 1993; Unsworth et al., 2011). Thus, it could be that individuals have different goals or foci in mind when asked "why do you do this job" (value or identity; most previous research) versus "why do you do this task right now" (task level; present study). This also relates to other goal theories, such as Gollwitzer's action phases of deliberation (e.g., desires, higher-order motivation) and implementation (e.g., task-related motivation) (Gollwitzer, 2012) and the role of desirability and feasibility considerations dominating in respectively distant (e.g., general work motivation) and near future activities (e.g., task related motivation) as described by Liberman and Trope (1998). Taken together, when having a value or desire in mind, individuals might answer motivation questions differently from when they have a task to complete. Consequently, the relation between task-related motivation and productivity or job satisfaction in day-to-day life might reveal different outcomes compared to previous between person approaches (Kuvaas et al., 2017; Van den Broeck et al., 2021).

Frequent day-to-day measurements and within person approach

To understand and promote performance and job satisfaction of workers, several researchers have suggested taking an individualized approach (Bakker, 2015; Binnewies et al., 2010; Dalal et al., 2014; Ilies et al., 2015). Conclusions based on (between-persons) group level data not necessarily generalize to individual participants, threatening the validity of conclusions drawn from typical research designs, also in psychological science (Fisher et al., 2018). Elucidating the relevant mechanisms at the individual and event levels paves the way for personalized interventions to improve performance by targeting timely and personally relevant motivational aspects, fulfilling basic needs, and adaptations in organizational processes. Fortunately, person-centered investigations of these questions are today enabled by daily life research methodologies (e.g., ecological momentary assessment), novel technologies (e.g., mobile applications; Spruijt-Metz, et al., 2014) and sophisticated statistical methods (e.g., multilevel and time-series models, Hamaker, 2012; 2017, Gaussian graphical models, Epskamp et al., 2018, and multiplex recurrence networks, Hasselman & Bosman, 2020). Notably, person-centered approaches on SDT regulations are not new (e.g. see this review by Howard et al, 2020). For example, Van den Broeck and colleagues (2013) identified four different 'motivation profiles' in multiple samples of workers, with those scoring highest on autonomous motivation also reporting most job satisfaction. While such approaches allow for the detection and comparison of naturally occurring groups (e.g. clusters of individuals) defined by particular profiles such, as cluster specific SDT regulations as well as their antecedents and consequences, they do not inform how task-level motivation (profiles) and work-related outcomes may covary over time within an individual.

In sum, previous research suggests that autonomous motivation is associated with higher performance and job satisfaction, and controlled motivation has generally been linked to worse outcomes (Deci et al., 2017; Kuvaas et al., 2017). These conclusions are mainly drawn from cross-sectional or longitudinal studies with few measurement times and typically describe between-persons associations between work-related motivation 'in general' and work-related outcomes 'in general'. Studying the relevant mechanisms within persons using a diary approach and at the individual as well as event or task level may reveal different outcomes. This may contribute to theorizing of these processes and mechanisms, as well as affect practical applications, such as personalized interventions to improve motivation quality, performance and job satisfaction.

Study overview and research questions

The present study used ecological momentary assessment (EMA) to investigate between persons, within persons, and the dynamics within persons over time, to what extent self-reported task-related motivation during a day is a predictor of self-reported performance (perceived productivity) and job satisfaction at the end of the day, as well as how the latter two predict next day task-related motivation.

Due to the novelty of the approach, the present study was explorative in nature and no specific hypotheses were set, though the following set of research questions were formulated:

(1) At the between-person level, what is the relation between task motivation and daily performance and job satisfaction?

While answered with a different methodological setup in the present study, this first question is similar to that employed in previous survey-based studies reporting that autonomous motivation is associated with higher performance and job satisfaction, and controlled motivation is generally linked to worse outcomes (Deci et al., 2017; Kuvaas et al., 2017). In addition, EMA can provide insight into temporary ordering and precedence of variables under study, e.g., when X happens, Y is likely to happen later within individuals and across days (Epskamp et al., 2018). This information is useful for understanding motivation's effects on outcomes and vice versa in daily life. Thus, two additional research questions included:

(1) Is daily task-related motivation a predictor of performance and job satisfaction at the end of that day?
(2) Are performance and job satisfaction predictors of next day task-related motivation?

Finally, EMA data with sufficient data within an individual, allows to generate individual network models as opposed to group-level analyses (Epskamp, et al., 2018). This may reveal important inter-individual differences in the relations between the variables under study, inform how this lines up with or deviates from group-level findings, and provide directions for more targeted motivation interventions. Thus, a fourth research question was:

(1) To what extent do the individual networks differ from one another as well as from the group-level models generated in response to research questions 2–3?

Methods

Ethical procedures

This study was performed in accordance with the Declaration of Helsinki. The study protocol received a favorable review from the University of Helsinki Ethical Review Board in the Humanities and Social and Behavioural Sciences.

Participants

We recruited human resource management professionals (n = 19), with considerable variance in their day-to-day work tasks, from large public sector organizations in Finland. Due to their work in human resources, we assumed the study topic (work motivation) was of interest, and that they would thereby be motivated to complete the intensive longitudinal data collection procedures. Potential participants were approached about participation during monthly departmental meetings, in which members of the research team presented a brief overview of the proposed study, including background information about the importance of studying work motivation, detailed information about the study procedures, and information about the potential benefits and risks of participating in the study. Interested persons received a participant information sheet and consent, which if returned to the research team, would enroll them in *the study.*

Measures

This study is part of a more comprehensive project assessing work-related motivation and work-related outcomes; an overview of all included measures and procedures can be found in supplementary material. Here, we describe only the measurements procedures used in the current study.

Baseline questionnaire

At baseline, demographic information including age, gender, highest education level attained, job title, number of years in current role and number of years within the organization were assessed in an online questionnaire via LimeSurvey.

Ecological momentary assessment (EMA)

Participants used a smartphone-based EMA app to record task-related motivation, productivity and job satisfaction, during working days (Monday through Fridays), for a default period of 30 working days, with the option to continue data collection as long as they wished. The app prompted participants five times over the course of each eight–hour working day: once at the start of the eight-hour workday, three random times during the eight hours, and once at the end of the eight-hour workday. During the eight-hour work period, participants could also open the app themselves to record extra measurement points (up to three completions). For each EMA recording, participants reported their current work task (from a predefined list of work tasks, but they could also add their own) and how motivated they were to perform that task. More specifically, items for motivational regulation asked participants to rate the following statements, each starting with: "I am working on this

task because": *it is pleasurable* (intrinsic); *it is interesting* (intrinsic); *it is important to me* (identified); *someone else wants me to* (external); *the situation requires me to* (external); *I would feel guilty or anxious if I did not* (introjected) (Ketonen et al., 2018). These statements were rated on visual analogue scales (VAS) with 49 increments, labeled from *disagree* to *agree*. The EMA recording at the end of the day contained questions about productivity as an indicator of performance *("overall how productive were you at work today? ")* rated on a VAS from *worst quality* to *best quality* (adapted from Schelvis et al., 2013) and job satisfaction (*"overall how satisfied were you with your work day today? "* rated on a VAS from *very dissatisfied* to *very satisfied*) (adapted from Scarpello & Campbell, 1983).

Data obtained with EMA was pre-processed prior to further analyses as follows: Momentary ratings of the two intrinsic items and the identified regulation item were averaged to compute a single momentary variable of autonomous motivation. To compute a single variable of controlled motivation, the average of momentary ratings of the two external regulation items and the introjected regulation item was calculated. Cronbach's alphas for autonomous motivation and controlled motivation items were 0.91 and 0.65, respectively. Daily aggregates of autonomous and controlled motivation were subsequently used for further analyses.

Study procedures

Enrolled participants were invited to attend individual face-to-face enrollment sessions delivered by MH, held either at their workplace or on the premises of the University of Helsinki. Each participant received a study specific unique ID and password for the online baseline assessment and the EMA app. After completing the baseline assessment electronically, participants took part in interviews to be introduced to the measurement process, to calibrate their understanding of the EMA questions. Interviews were recorded and lasted maximally 75 min, ensuring that the entire enrollment session was shorter than 90 min. At the conclusion of the enrollment session, participants were asked to install the EMA data collection app on their smartphone, and to enter their study ID number on the app's login screen, to allow anonymous linkage between their baseline assessment and EMA responses. All data were collected in the months October 2018 to February 2019.

Analyses

Data analysis was carried out using R statistics (v3.6.1). To study the effect of motivation on productivity and job satisfaction, network models were utilized (Package 'mlVAR' v0.4.3 in R, Espkamp et al., 2019). These network models can be used to explore relations between measured, time dependent variables. These multilevel vector autoregressive (mlvar) network models visualize the underlying relations within the data within and between persons, taking into account the multi-level data structure. Restricted maximum likelihood estimation was used when analyzing the data. Three different networks models were visualized: between networks, indicating the differences between individuals (research question (1), contemporaneous networks, indicating the within person effects within a given measurement (e.g., within a day with daily aggregates) (research question 2), and temporal networks, indicating the fixed effects found when using t to predict t + 1 (Epskamp, et al., 2018) (research question 3).

Prior to calculating networks, missing data were handled as follows. First, data was restructured in such a way that each row represented one day. Subsequently, data was deleted pairwise: when either the independent (lagged or not lagged), or the dependent variable for that timepoint was not present, the measurement was not accounted for in the analysis.

Networks were calculated using a combination of partial correlation analyses and Bayesian networks. Supplementary material contains a reproducible example without personal data (see also Epskamp et al., 2019). This allowed for an estimation method that scaled well up to eight variables (nodes) and acceptable up to 20 variables, which was sufficient for the current application. For the current estimation, the default settings were used, allowing for estimation using lmer as estimator, and allowing random effects to be correlated rather than orthogonal. Using the mlVAR models, random effects were extracted to create individual networks, for which contemporaneous and temporal networks were visualized (research question 4).

Of the networks mentioned, only for the temporal network a clear temporal relation may be found. For the between-person and contemporaneous (within-person) networks, the relation is estimated both ways: from variable A to B, and from variable B to A, taking into account the effect of all other variables on this relation. As such, this results in one partial correlation, but two associated p-values. As the present study was intended to discover which relations may be present, a significant relation was assumed if one of the p-values is below 0.05. Moreover, for the individual networks, no significance was calculated due to the complications that would add to the method.

Results

Baseline characteristics

To allow for a multilevel model with sufficient data, the network linking the aggregated mean per day for

Table 1 Participant characteristics

N	14
Age in years, mean (SD)	39 (8.1)
Sex	9 Female, 2 Male, 3 not reported
Job roles	HR / Recruitment consultant (10)
	Project manager (2)
	Safety manager (1)
	Designer (1)
Years in role, mean (SD)	3.3 (3.1)
Years in organization, mean (SD)	9.8 (10.3)

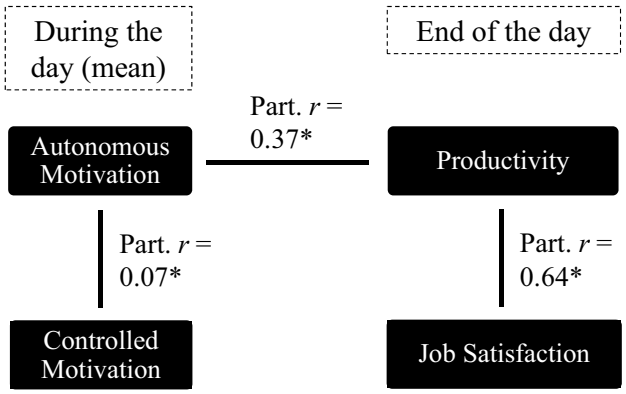

Fig. 1 The group level between person relations (between network). Only significant associations are shown. *P* values: * < 0.05

autonomous and controlled motivation to productivity and job satisfaction was selected from the individuals who completed at least 10 days with recordings of autonomous and controlled motivation, as well as ratings of their productivity & job satisfaction. This cut-off for sufficient data was based on previous EMA simulation studies showing that at least 10 observations are required to retrieve measurements of sufficient reliability within persons (Krone et al., 2016). This resulted in 14 included individuals (Table 1) with an average of 23 complete days and over 1300 measurement points. Five participants were excluded due to insufficient data.

Between person group level outcomes (research question 1)

Figure 1 shows the significant group level between person relations based on the between network. Autonomous motivation during a day was positively associated with productivity (partial $r = 0.37$, $p < 0.05$), but unrelated to job satisfaction at the end of the day. Controlled motivation was neither associated with productivity nor with job satisfaction.

Table 2 Between- and within-person variability of the variables under study

Variable	Between-person variability	Within-person variability
Autonomous motivation	66	81
Controlled motivation	39	88
Productivity	25	54
Job satisfaction	20	46

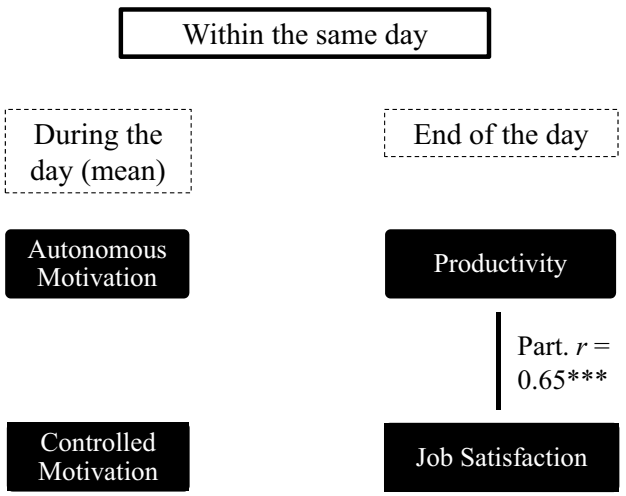

Fig. 2 The group level within person relations (contemporaneous network). Only significant associations are shown. *P* values: *** < 0.001

Within person group level outcomes within the same day (research question 2)

Prior to answering research question 2, the degree of within-person variability and between-person variability was determined for autonomous and controlled motivation, as well as for productivity and satisfaction. For each of these variables, the within-person variability was higher than between-person variability (Table 2), suggesting it is feasible and sensible to investigate within-person processes in the dataset.

Figure 2 shows the group level within person relations based on the contemporaneous network. The association between productivity and job satisfaction was significant. The association between autonomous motivation and productivity was negative ($p = 0.06$). The association between controlled motivation and productivity was positive ($p = 0.055$). The association between either type motivation and job satisfaction was not significant (p's > 0.17). In summary, daily task-related motivation did not significantly predict performance or job satisfaction at the end of that day.

Lagged within person group level outcomes (research question 3)

Figure 3 shows the significant lagged group level within person relations (temporal network). Answering research question three: Productivity rated at the end of the day was negatively associated with next day autonomous and controlled motivation; Job satisfaction rated at the end of the day was positively associated with next day controlled motivation, but not associated with next day autonomous motivation.

Individual network models (research question 4)

For the individual networks only negative relations stronger than -0.1 and positive relations stronger than 0.1 are discussed, yet no significance was calculated. For 12 out of the 14 individuals, the average autonomous motivation for tasks of that day was negatively related to self-reported productivity at the end of the day (partial *r*'s from − 0.12 to − 0.20) whereas for each of the 14 individuals the average controlled motivation for the tasks during the day was positively related to self-reported productivity (partial *r*'s from 0.12 to 0.17). In turn, productivity at the end of a day was negatively related to next day autonomous (partial *r*'s from − 0.13 to − 0.22) and controlled task motivation (partial *r*'s from − 0.18 to − 0.36) for all individuals.

In 6 out of 14 individuals, autonomous motivation during the day was positively related to job satisfaction at the end of the day (partial *r*'s from 0.11 to 0.29). For all 14 individuals, controlled motivation during the day was not related to job satisfaction at the end of the day. Job satisfaction at the end of a day was positively related to autonomous motivation the next day for 8 individuals (partial *r*'s from 0.10 to 0.14) and controlled motivation the next day for all 14 individuals (partial *r*'s from 0.18 to 0.40). In sum and to answer research question four: Individual networks do differ considerably.

Discussion

This study investigated, at the between-persons, within-persons, and individual levels, the extents to which self-reported motivation during a day predicts self-rated productivity and job satisfaction at the end of the day, as well as how the latter two predicted next day motivation. Outcomes varied substantially across the different analysis approaches and are not fully consistent with self-determination theory (SDT; Ryan & Deci, 2000), which states that higher levels of autonomous motivation should be related to more positive work-related outcomes, whereas controlled motivation should lead to less favorable outcomes.

Discussion of the main findings

In the present study, the differences *between* individuals in terms of autonomous motivation related to differences *between* individuals in terms of productivity but not to differences *between* individuals in terms of job satisfaction (*research question 1*). These results are in line with previous results found in between-persons studies (Van den Broeck et al., 2021). More specifically, the present results suggest that when motivation is measured repeatedly and intensively at task level and productivity is measured repeatedly at daily level, individuals who reported higher levels of autonomous motivation also reported higher levels of productivity (but not higher job satisfaction), though not necessarily on the same day. Furthermore, the differences *between* individuals in terms of repeatedly assessed controlled motivation did not

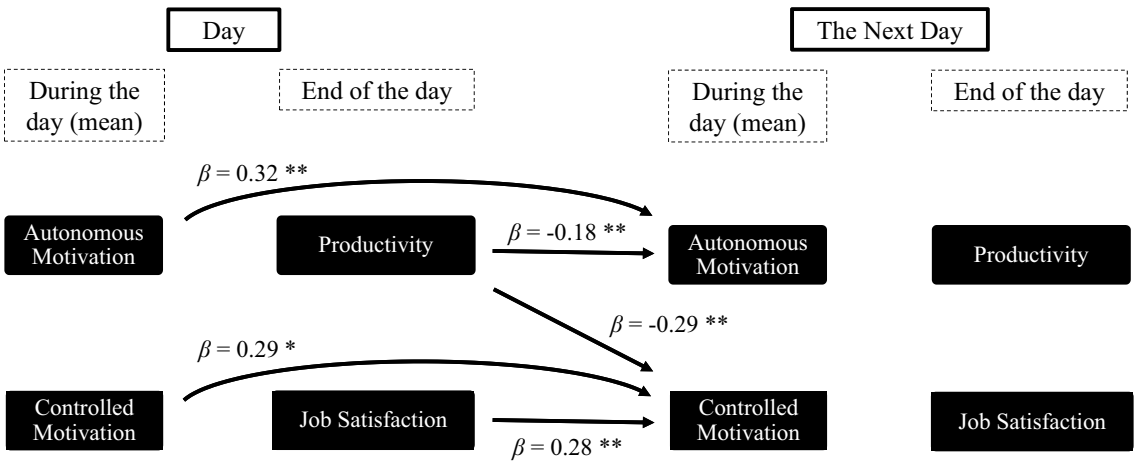

Fig. 3 The lagged group level within person relations (temporal network). Only significant associations are shown. *P* values: * < 0.05; ** < 0.01

relate to differences *between* individuals in terms of repeatedly assessed productivity or job satisfaction.

At group level within persons, autonomous and controlled motivation were not associated with self-reported productivity or job satisfaction *(research question 2).* Thus, at this level, the results are not in line with those found in between-persons studies. Day-to-day fluctuations in work motivation were not shown to influence daily productivity and daily job satisfaction.

In the lagged within-person analyses *(research question 3)* productivity at the end of a day was negatively related to next day autonomous and controlled task motivation. In contrast, job satisfaction at the end of the day was positively related to next day controlled task motivation and unrelated to next day autonomous task motivation. These results are again not in line with those at the between-persons level. Surges in daily productivity preceded lower motivation in general the next day, whereas surges in daily job satisfaction preceded higher controlled motivation on tasks the next day (but not autonomous motivation).

For the individual networks, no significance was calculated due to statistical complexity. Nevertheless, they are in line with the (significant) outcomes of the lagged within-person group level analyses (RQ 3) and provide insight into interindividual heterogeneity. For example, *each* of the 14 individuals felt less motivated in general the next day after a more productive day (or vice versa). Further, for *each* of the 14 individuals, days with higher ratings of job satisfaction were followed by days with higher levels of (only) controlled motivation (or vice versa). More heterogeneity was seen in the relation between autonomous motivation and job satisfaction. In 6 out of 14 individuals, autonomous motivation during the day was positively related to job satisfaction at the end of the day (partial *r*'s from 0.11 to 0.29), whereas in the other individuals negative or absent relations were observed (data not shown). Thus, for some but not all individuals the networks are in line with previous results found in between-persons studies (Van den Broeck et al., 2021).

All in all, the outcomes of the present study present more nuanced findings at a within-person level and demonstrate that these will not inherently align with previous between-person findings (Gagné et al., 2010; Howard, et al, 2016; Kuvaas et al., 2017; Richer et al., 2002).

The discrepancy with prior research may be related to variable specificity and timescales studied. Survey studies typically use scales to tap into an individual's overall work motivation (e.g., how motivated they are in general or in the past weeks/months), as well as summary measures of productivity and job satisfaction over a longer period of time (e.g., Gagné et al., 2010, 2015; Kuvaas et al., 2017; Richer et al., 2002). The present study however focused on motivation for a specific work task at hand, and day-level satisfaction and productivity. In line with goal theory (Cropanzano et al., 1993; Gollwitzer, 2012; Liberman & Trope, 1998; Unsworth et al., 2011), individuals may answer motivation questions differently when they have an abstract value or general desire in mind than when they have a task to complete. Correspondingly, an explanation for the present studies' findings may be that when people are completing tasks in their daily routine, due to time pressure, feasibility, and a focus on implementing (rather than thinking about the lofty goal), controlled motivation may become more highly related to productivity than is observed in previous survey-based research using a between-person approach (Kuvaas et al., 2017; Van den Broeck et al, 2021).

The discrepancy with prior research may further arise from a difference between daily self-rated productivity as was assessed in the current study versus overall job performance which is commonly used in previous research (Kuvaas et al., 2017; Van den Broeck et al., 2021). In the latter, individuals (or their supervisor) are often asked if the individual does their job well (in general), meets the job requirements, are flexible at work, proactive, good team players, and so forth (Carpini et al., 2017). Focussing on daily productivity (which may be a combination of qualitive *and* quantitative performance and reflect a sense of daily accomplishment) may at least to some extent explain why results show relatively stronger associations with controlled than autonomous motivation, as compared to prior research on motivation and job performance (Gagné & Deci, 2005; Kuvaas et al., 2017; Van den Broeck et al, 2021). In addition, there is research, drawing on theories of psychological contrast, showing a curvilinear cross-task effect of intrinsic motivation on performance in subsequent tasks. For example, Shin and Grant (2019) report a field and a laboratory study in which high intrinsic motivation in one task was followed by lower performance in other tasks, an effect that was mediated by boredom. In our study, individuals may have started their day by picking the most interesting task (and report their motivation for this) followed by less fun/interesting tasks during the remainder of the day in which they may have performed less, before reporting their productivity and job satisfaction at the end of the day. Though the averaged task motivation across the day might still be relatively high, sense of accomplishment later in the day might have been low, which may have influenced the "close in time" performance rating, explaining why within-person results for productivity show relatively stronger associations with controlled and weaker associations with autonomous motivation, as compared to prior research.

Another difference with previous studies is that they had much larger participant samples ranging from 122 up to 4518 (Gagné et al., 2010; Kuvaas et al., 2017; Richer et al., 2002). It is possible that the small sample of 14 participants is the reason for the discrepancy with previous studies, although each of these participants on average

completed 23 days of data collection, providing a dataset of 322 comparisons of motivation to productivity and job satisfaction, but nested within 14 individuals. Finally, it should be noted that previous between-person studies have used longer, validated scales of the constructs, whereas EMA studies are bound to rely on short, one-item scales of the constructs, with less-than-optimal reliability and validity. Yet, the between-person group level findings on the aggregate levels of autonomous motivation and productivity suggest these concerns may not be valid, as the observed association between autonomous motivation and productivity is in line with the literature (Gagné & Deci, 2005; Kuvaas et al., 2017). In addition, during the interview procedure each participant's understanding of the questions was calibrated to match that of the researcher, adding to questionnaire validity.

In addition to the abovementioned methodological differences with prior between-person research, analysing associations at different levels of analyses (between-persons, within-persons, individual networks) may produce different results. Whereas a significant association between autonomous motivation and productivity between-person was observed, at the group level within persons, motivation during work tasks (autonomous or controlled) was not associated with self-reported productivity or job satisfaction at the end of that day. In fact, the group level within-person association between autonomous motivation and productivity was negative (borderline significant) whereas the association between controlled motivation and productivity was positive (again borderline significant). Importantly, these patterns were reflected in almost all of the individual models. Taken together, these findings illustrate it might be unwise to exclusively base best-practice guidelines aimed to promote motivation, productivity, and job satisfaction, on statistical inferences from aggregated between-person analyses across large samples. This is in line with the ongoing discussion that generalizing conclusions based on between-persons group level data to individual participants may be worryingly imprecise (e.g., Fisher et al., 2018). Instead, findings from within-person studies should be considered as well as they may shed a different or somewhat nuanced view on phenomena under study compared to between-person approaches and can be taken into account before generalizing conclusions or formulating recommendations and best-practice guidelines.

The observed interindividual heterogeneity (e.g. the relation between autonomous motivation and job satisfaction) further underscores the value of an individualized approach to studying occupational behavior and wellbeing (Bakker, 2015; Binnewies et al., 2010; Dalal et al., 2014; Ilies et al., 2015).

Temporal relations in one-day lagged analyses

The present study also investigated temporal relations using a one-day lag. At the group level within persons, job satisfaction (rated at the end of the day) was not associated with autonomous motivation, but was positively associated with next day controlled motivation. In the individual models, job satisfaction was positively associated with (a) autonomous motivation the next day for 8 out of 14 individuals (partial *r*'s from 0.10 to 0.14) and with (b) controlled motivation the next day for each of the 14 individuals (partial *r*'s from 0.18 to 0.40). These results suggest that when individuals are more satisfied with their job at the end of a given day, it increases the extent to which they are willing to do something for others, to obtain rewards or avoid punishments, or for self-worth related concerns the next day; more so, than the extent to which they do something because it is joyful, interesting, and/or meaningful to them the next day. Since job satisfaction is an expression of approval of a work environment (Locke, 1976), it stands to reason that if an individual is satisfied with their job when reflecting on their workday, they are more likely to be more motivated at work the following day. This concurs with a daily diary study reporting that, at the intraindividual level, job satisfaction predicted reports of organizational citizenship behaviors over time (Ilies et al., 2006). Our study extends these findings by illustrating a 1-day lagged, within person relation of daily job satisfaction to next day motivation.

Noteworthy is also the observation that self-reported productivity was negatively associated with next day autonomous and controlled motivation. Though it may be tempting to suggest that productivity has a 'motivation flattening' effect, the observed associations are not causal relations. An alternative explanation might be natural altering of work tasks. For instance, if one completes a major and effort-requiring undertaking at work, he or she may feel highly productive at the end of the day. The next day, it might actually be healthy–or necessary from the perspective of one's work–to perform work tasks that are not that demanding and engaging right away, such as more "routine tasks" which may receive lower motivation ratings. As such, the observed association between productivity and motivation the next day may also reflect a pattern of work (task) organisation over time and actually be a healthy self-regulatory recovery pattern or a naturally occurring work pattern. Though speculative, it may also be seen as 'reducing demands' as a form of job crafting, which has previously been shown to relate to lower work engagement, an indicator of motivation (Demerouti et al, 2015).

Strengths and weaknesses of the present study

Whereas most studies investigating self-determined motivation in relation to work related outcomes have utilized single or a few measurement points and have only examined between-persons relations (e.gGagné et al., 2010, 2015; Kuvaas et al, 2017; Otis & Pelletier, 2005; Richer et al, 2002) the present study employed an intensive longitudinal design (EMA) and predominantly took a within-person approach. A strength of the present study is that office workers' work-related motivation, productivity and job satisfaction were frequently and repeatedly assessed as opposed to the most common applied pre-post measurements. The fourteen individuals included in the analyses had completed an average of 23 days' worth of ratings of motivation, productivity, and job satisfaction. Using advanced statistical techniques including multilevel and network models, the data allowed for within-person analyses as well as individual networks of temporal relations between autonomous or controlled motivation, productivity and job satisfaction, which to our knowledge, has not been done previously. Another strength of the study is that it was conducted in real life, providing data with high ecological validity. Furthermore, in contrast to using surveys that ask participants to rate their motivation and work-related outcomes 'in general' or over a specific retrospective period, which is prone to retrospective bias, with EMA the data were collected close in time to experience, limiting retrospective bias.

At the same time, the study also has several limitations. Although data were collected intensively within persons, only 19 individuals were included, of whom 14 completed sufficient assessments to perform the planned analyses. This is a small sample size for between-persons analyses and may in part explain why at the between-persons analyses (Fig. 1), we found no statistically significant association between autonomous motivation and job satisfaction, as has been reported by others (e.g., Gagné et al., 2010; Richer et al., 2002). Further, only productivity and job satisfaction were assessed as work-related outcomes, whereas other studies have also focused on organizational commitment (Kuvaas et al., 2017), future work intention (Otis & Pelletier, 2005), emotional exhaustion (Richer et al., 2002) and meaningful work (Autin et al., 2021). Due to practical considerations of intensive longitudinal study designs, we were not able to assess these additional variables that may be investigated in further studies. Also, whereas others have used supervisor ratings of employees' productivity (e.g., Kuvaas et al., 2017), in the present study productivity was measured by self-report, which may be subject to social desirability or inaccuracy, as individuals may not be able to reliably evaluate their productivity. Another limitation is that motivational orientations were aggregated to autonomous and controlled motivation, which may have obscured relations between specific motivational orientations and work-related outcomes. For example, one study found that performance was more strongly correlated to identified than to intrinsic motivation (Gagné et al., 2015). Another limitation–inherent to all EMA studies–is the difficulty of using comprehensive scales of the psychological constructs and other variables. EMA necessitates using short, even one-item scales, whereas cross-sectional studies enable using validated scales, tapping into the multifaceted nature of the theoretical constructs. Indeed, while EMA allowed us to study task-related motivation with a much higher time-resolution than survey-based studies, task characteristics (e.g., task complexity) were not specified. This is an unfortunate trade-off, as previous research highlights the relevance of including task characteristics when studying the quality of motivation in relation to job performance (Gagné & Deci, 2005). Further, the item measuring extrinsic motivation ("I am working on this task because the situation requires me to"; Ketonen et al., 2018) may not be tapping into the essence of the construct, as the person may fully endorse 'what the situation requires' for autonomous reasons. An optimal operationalization would perhaps tap more into the felt social pressure as the driver of the behavior.

In terms of the model used, we should be mindful of the limitations brought about by the assumptions made. For example, there is no reason to assume lags beyond one day carry no effect on subsequent moments or that the effects do not vary in time (Bringmann et al., 2017). In addition, there is little reason to assume that the effects are linear, i.e. inputs are proportional to outputs, multivariate normality does not self-evidently hold in many cases, and the autocorrelation function might not be stationary over time, confounding the results (Kelty-Stephen & Wallot, 2017; Kelty-Stephen et al., 2013). To relax these assumptions, more within-individual data would be needed, but a promising alternative avenue would be a shift to (e.g., recurrence based) methods for analysing multivariate time series data, which do not require the aforementioned assumptions (Hasselman & Bosman, 2020).

Implications / Future perspectives

The present study used a novel approach to study the association between motivation and work-related outcomes. As we included HR workers from public sector organizations in Finland, we would anticipate that these findings would be generalizable to most public sector HR workers and Europe, and possibly further afield. Above all, this approach should be considered complementary to the frequently used between person approach in large cross sectional or cross-lagged studies which, in line with SDT (Ryan & Deci, 2000), have shown that higher levels of autonomous motivation are related to more positive work-related outcomes (e.g., Gagné et al., 2015; Kuvaas

et al, 2017; Otis & Pelletier, 2005; Richer et al, 2002). The present study illustrates that this relation may differ, especially when intensive time-series data are analyzed using a within-person or individual networks approach, and when motivation is conceptualized at lower-level (i.e., momentary task motivation rather than generalized work motivation). This may stimulate researchers in this field to take such approaches more into account. For example, future studies focusing on within person processes and individual networks may also include variables such as emotional exhaustion (Richer et al., 2002), future work intention (Otis & Pelletier, 2005), work engagement (Bakker & Oerlemans, 2019; Demerouti et al., 2015), organizational commitment (Kuvaas et al., 2017), and meaningfulness (Autin et al., 2021). Elucidating the relevant mechanisms at the individual level is necessary to develop and test personalized interventions.

Another suggestion for future research is to combine more traditional survey-based approaches with EMA in the same participants. That way, using validated scales and tapping into the multifaceted nature of the theoretical constructs can be combined with daily assessments for within person relations and temporal dynamics. Calls for such research have also been made by others (e.g., Bakker et al., 2015; Ilies et al., 2015). Finally, many of these perspectives converge to moving into a complex systems approach, which has been previously applied in occupational health (Ceja & Navarro, 2017; Navarro & Arrieta, 2010; Navarro & Rueff-Lopes, 2015) and is now being applied to self-determined motivation processes (Heino et al., 2021). This has the potential to address several recently identified problems regarding both traditional (e.g. Borsboom et al., 2009; Maul, 2017) and EMA (Ram et al., 2017) survey research.

Conclusion

Previous research on work related motivation and work-related outcomes, often employing single or few measurement points and between-person approaches, has related autonomous motivation to higher job satisfaction and productivity, and controlled motivation to worse outcomes. Using ecological momentary assessment, within-person, and individual network modelling, this study could not replicate these findings, raising the question whether these relations hold within persons over time. More research within persons is needed to address this question and to pave the way for personalized interventions to improve work-related outcomes.

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Declarations

Conflict of interest All authors declare that they have no conflict of interest.

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