



# Remote Work Intensity in Knowledge Work: Associations with Informal Workplace Learning, Basic Psychological Needs Satisfaction, Job Satisfaction, and Turnover Intention

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## Abstract

The increase in remote working has changed the way both employees and organizations view work in an already tumultuous landscape of the IT sector. In this study, we surveyed Finnish employees ( $n=266$ ) from an international IT sector company in 2022 after the remote working mandates were lifted. We firstly examined how remote work intensity (RWI) was associated with informal workplace learning, basic psychological needs satisfaction (BPNS, including autonomy, competence, and relatedness), work engagement, job satisfaction, and turnover intention (RQ1). Second, we investigated using structural equation modeling (SEM) how informal workplace learning, BPNS, and RWI were associated with work engagement and well-being outcomes (job satisfaction and turnover intention) (RQ2). Finally, with RQ3, we examined whether work engagement mediated the associations investigated in RQ2. Results for RQ1 were generally against our expectations as RWI was associated only with relatedness satisfaction (negatively). SEM results for RQ2 generally matched our expectations, as autonomy and relatedness satisfaction were positively related to job satisfaction and negatively related to turnover intention. Furthermore, there was an indirect-only mediation via work engagement between informal workplace learning and job satisfaction, and autonomy satisfaction and turnover intention, in addition to a complementary mediation via work engagement between autonomy satisfaction and job satisfaction (RQ3). The results imply that RWI is not distinctly beneficial or detrimental for learning and well-being at work, however, hybrid work may be preferable in supporting learning and well-being at work compared to full-time remote working.

**Keywords** Remote work · Basic psychological needs satisfaction · Informal learning · Work engagement · Job satisfaction · Turnover intention

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## Introduction

During the last few years, remote and multilocal work have become a prevalent way of working in knowledge work. Knowledge work in the IT sector has been significantly affected, as it is often not constrained by physical location. Remote and multilocal work have been studied in relation to well-being and efficiency for over two decades but research has rapidly increased in recent years during and after COVID-19 pandemic (see Vacchiano et al., 2024). Nevertheless, the current widespread remote working that is not anymore forced by the pandemic differentiates from the previous research context in various ways. The availability, acceptability, and utilization of remote working in knowledge work is unprecedented. Thus, pre-pandemic studies or research on forced remote working do not necessarily apply to current and forthcoming realities in work (Torres & Orhan, 2023). Furthermore, worries about the negative effects of remote working have been in the limelight resulting in organizations to unilaterally restrict remote working. Further research on remote working is thus needed to guide organizations in their actions, in addition to understanding the influence of remote working in the IT sector knowledge work.

In terms of learning and well-being at work, remote working can be seen to influence factors related to social interactions, performance, and managerial work (e.g., Mühlenbrock et al., 2023; Zajac et al., 2022). As most of the learning at work is considered to happen informally (Cerasoli et al., 2018) or, in other words, through work (Billett, 2010), important sources of this learning, such as model learning and feedback (Decius et al., 2019) differ substantially between remote and on-site working. The decrease of certain common work behaviors (e.g., pre-meeting talks) can hinder informal learning as relevant information is exchanged in these auxiliary interactions. While these behaviors can be supported via deliberate planning, facilitation, and use of digital tools (see e.g., Andrade et al., 2024), they require additional effort from organizations, leadership, and employees. Digital tools and the limited distractions provided by remote working can support individual learning processes (e.g., self-directed learning; Lemmetty & Collin, 2020) depending on job description and tasks, however, collaborative efforts are needed to produce team learning and actualize informal learning in context.

In addition to commonly researched outcome-related job attitudes (e.g., job satisfaction and turnover intention; Judge & Kammeyer-Mueller, 2012), remote working can affect more antecedent and process-related factors such as perceptions of work engagement (Bakker & Demerouti, 2017) and the satisfaction of basic psychological needs for autonomy, competence, and relatedness (Ryan & Deci, 2017). In previous studies, these factors, alongside informal learning, have been found to be linked positively to job satisfaction and negatively to turnover intention (e.g., Cerasoli et al., 2018; Mazzetti et al., 2023; Van den Broeck et al., 2016).

While existing literature provides mixed results nevertheless leaning to favoring remote working, current widespread remote working can contribute to these factors and their relationships in ways yet studied. Previous studies indicate positive effects (particularly of hybrid or multilocal work) to well-being (e.g., Bloom et al., 2022; Gagné et al., 2022; Gajendran et al., 2024), including higher job satisfaction, perceived autonomy, and lower attrition but also negative aspects are highlighted such

as higher social isolation (Gajendran et al., 2024) and work-home conflict (Gagné et al., 2022). Consequently, the effects of remote working on learning and well-being at work are complex and may differ from those observed prior to the increase in remote working and during the COVID-19 forced remote working.

This study aims to investigate the relationships that remote work intensity (RWI, i.e., weekly days working remotely) have on learning and well-being at work in white-collar post-pandemic hybrid work context. Furthermore, we wanted to model the associations between informal workplace learning and well-being at work to reflect on the results from the pre-pandemic studies (e.g., Puhakka et al., 2021) while including RWI in the mix. Specifically, we wanted to investigate how basic psychological needs satisfaction (BPNS; Ryan & Deci, 2017), informal workplace learning, and work engagement are connected to job satisfaction and turnover intention, and whether RWI is a significant predictor in the model.

The present study presents three research questions: RQ1) “Is RWI associated with informal workplace learning, BPNS, work engagement, job satisfaction, and turnover intention?”, RQ2) “How informal workplace learning, BPNS, and RWI are associated with work engagement, job satisfaction, and turnover intention when modeled simultaneously”, and RQ3) “Does work engagement mediate the relationship between informal workplace learning and well-being outcomes (job satisfaction and turnover intention), and between BPNS and well-being outcomes (job satisfaction and turnover intention)?”.

## Theoretical Framework

### Remote Work Intensity

Remote working is defined here as working away from the primary workplace. Research on comparing remote and on-site working has indicated both benefits and challenges of remote working. This is particularly relevant to knowledge work (i.e., work that requires extensive formal education and continuous learning, involves design and planning in addition to self-managing tasks, and produces knowledge as a primary outcome; Pyöriä, 2005), as this type of work can be often performed remotely. As hybrid or multilocational working (i.e., working at other locations than office for some but not all the time) has become more common, it is relevant to focus on whether the weekly time spent working remotely (i.e., RWI) has an impact on work, workplace learning, and well-being at work. Measuring this kind of RWI and its associations with different work-related factors is a way to examine the benefits and hindrances of remote working (see Gajendran et al., 2024).

### Informal Workplace Learning and Remote Working

In this study, informal workplace learning is conceptualized using the octagon model of informal workplace learning (Decius et al., 2019) which includes four components: experience/action, feedback, reflection, and intention to learn. Experience/action component refers to engaging with new experiences by either doing (trying

and applying their own ideas) or observing them (model learning). Feedback component includes direct and vicarious feedback in which the learner is an active participant (i.e., asks for feedback). Reflection component addresses anticipatory and subsequent reflection, that is, thinking about how to do things better beforehand and evaluating ways to improve task performance afterwards. Finally, intent to learn refers to learning in order to further one's own career or to solve problems at work faster.

The reduced number of face-to-face encounters in remote work settings influences informal learning regarding its social dimensions (Zajac et al., 2022), since learning at work can be seen to happen by collaborating and participating in “communities of practice” (Lave & Wenger, 1991). Remote work context may offer less rich and more restricted communication due to diminished social support and fewer learning cues and opportunities, reducing opportunities for informal workplace learning (Mühlenbrock et al., 2023). In relation to the octagon model (Decius et al., 2019), particularly challenging dimensions in remote work are model learning and feedback (e.g., higher risk of misinterpretation; Jansson & Kangas, 2025).

An important venue for informal learning in knowledge work are meetings and different collaborative sessions. As meetings have moved to remote settings, the need and use of digital skills and digitalization of learning and professional development in work has increased drastically compared to the discussion of this digitalization before the pandemic (Wallin et al., 2020). Companies in the IT sector currently utilize extensive digital tools to communicate and collaborate remotely (e.g., Jackson et al., 2022). Digital technologies provide flexible access to interaction, enabling learning through online meetings and discussion forums, and enrich interaction through chat, screen sharing, and emojis (Karhapää et al., 2024). Nonetheless, the lack of local encounters can lead informal communication to be less spontaneous and more siloed (Begemann et al., 2024).

In addition to purely interactive actions (e.g., feedback and model learning), informal learning happens through more individually initiated processes such as reflection (Decius et al., 2019). These processes can benefit from less interruptions provided by remote working, though reflection can also be a collaborative process which promotes team learning (e.g., Faller et al., 2020). While individual reflection can benefit from remote working, a high RWI can impede opportunities to participate in and engage with communal activities at work, even when addressed in hybrid work environments. We thus expect that RWI is negatively associated with informal workplace learning (H1).

## Basic Psychological Needs Satisfaction and Remote Working

Basic psychological needs are a central part of the Self-Determination Theory (SDT; Ryan & Deci, 2017) which considers motivation in the context of psychological growth and well-being. SDT proposes the following three different types of motivation from the most optimal to the least (Ryan & Deci, 2000): intrinsic motivation (doing an activity for the satisfaction of the activity itself), extrinsic motivation (doing an activity to reach a separate outcome), and amotivation (lack of motivation). SDT emphasizes that the satisfaction of basic psychological needs of auton-

omy, competence, and relatedness is essential to producing and supporting intrinsic motivation and autonomous types of extrinsic motivation (Ryan & Deci, 2000). In work context, BPNS has been found to relate to various positive outcomes, such as job satisfaction, positive affect, and work engagement (see Gagné et al., 2022; Van den Broeck et al., 2016).

Autonomy refers to individual's need to self-regulate their experiences and actions, more specifically to the need for an internal perceived locus of causality providing self-endorsed behavior (Ryan & Deci, 2017). Competence refers to the need for feeling effectance and proficiency, while relatedness refers to the need to connect to other people and the need for belonging. These basic psychological needs and their satisfaction can be thought to play a relevant role in hybrid and remote working contexts as they consider aspects of work that are influenced by the changes in both individual and communal domains resulting from increased RWI.

In general, remote working can have both positive and negative effects on need satisfaction (see Gagné et al., 2022). Remote working can provide opportunities for better autonomy satisfaction, particularly when managers don't leave remotely working employees on their own but provide an appropriate balance of autonomy support and control (Pianese et al., 2023). On the other hand, more intense monitoring from the management and increased home-work conflicts can have a negative influence on autonomy satisfaction (Gagné et al., 2022). Nonetheless, pre-pandemic studies found a positive association between RWI and perceived autonomy with results from the studies done during pandemic yielding similar (nonsignificant) positive associations (Gajendran et al., 2024). Furthermore, a recent study found that the amount of daily remote work hours was positively related to autonomy satisfaction (Kesenheimer et al., 2025). Due to these characteristics and based on the previous research, we expect that RWI is positively associated with autonomy satisfaction (H2a).

Competence satisfaction has not been studied in relation to remote working except for rare cases (Brunelle & Fortin, 2021; Kesenheimer et al., 2025). Brunelle and Fortin (2021) found a positive association of teleworking (i.e., working hybrid or fully remotely) and competence satisfaction, however, they did not investigate RWI but compared fully office-bound employees and hybrid/remote workers. Kesenheimer et al. (2025) found that daily amount of remote working was positively related to competence development. Remote working can support role clarity and self-efficacy which can have a positive impact on competence satisfaction, however, increased information overload and technical issues can hamper it (Gagné et al., 2022). Nevertheless, the studies often compare remote/hybrid and office work, not RWI (e.g., Gajendran et al., 2024). RWI, particularly in organizations which encourage remote and multilocal working, can be expected to support competence satisfaction because employees can organize their work in ways that utilize the best of both remote and on-site settings. Furthermore, as forced remote working was already lifted when the data were collected, we expect that employees had influence in choosing their RWI. Based on these factors and previous research, we expect that RWI is positively related to competence satisfaction (H2b).

Working at home has been associated with lower perceived relatedness (Peijen et al., 2024) and higher perceived isolation (Gajendran et al., 2024), while daily amount of remote working has been found to negatively associate with relatedness satisfac-

tion (Kesenheimer et al., 2025). In addition to isolation, remote working can hinder the creation and maintaining support networks and meaningful collegial relationships (Gagné et al., 2022). Spontaneous encounters at work that facilitate not only learning and information sharing, but also relationship- and team building, are more likely to occur in the office (e.g., pre-meeting talks; Allen et al., 2014).

Gagné et al. (2022) highlight that increased remote working technologies can provide possibilities to connect with people across time and space. Furthermore, the appropriate use of digital tools and technologies can support the lack of physical presence (Dulebohn & Hoch, 2017). Digital tools can provide flexible access to and enrich remote interaction (Karhapää et al., 2024) and are increasingly utilized in the IT sector to communicate and collaborate remotely (e.g., Jackson et al., 2022). Despite the possible benefits of remote working, based on recent research (Gagné et al., 2022; Gajendran et al., 2024; Kesenheimer et al., 2025; Peijen et al., 2024), we expect that RWI is negatively associated with relatedness satisfaction (H2c).

### **Work Engagement and Remote Working**

According to the Job Demands-Resources model (JD-R; Bakker & Demerouti, 2017), work engagement can be described as a relatively stable, positive, and fulfilling work-related state of mind including vigor, dedication, and absorption. In addition to previous research indicating a positive link between high RWI and work engagement (e.g., Nagata et al., 2021), knowledge work can benefit from the concentration and perseverance enhanced by remote working (Allen et al., 2015). On the other hand, work engagement is linked to relatedness and social interaction at work (Van den Broeck et al., 2016), which can suffer from high RWI due to increased perceived isolation (Gajendran et al., 2024). Studies conducted during early parts of COVID-19 pandemic indicate that work engagement in remote work is high (e.g., Mäkikangas et al., 2022), however, recent meta-analytic findings have found weak and nonsignificant associations between RWI and work engagement in pre- and during pandemic studies (Gajendran et al., 2024). Based on the flexibility of the IT sector knowledge work and previous research, we expect RWI and work engagement to have a positive relationship (H3).

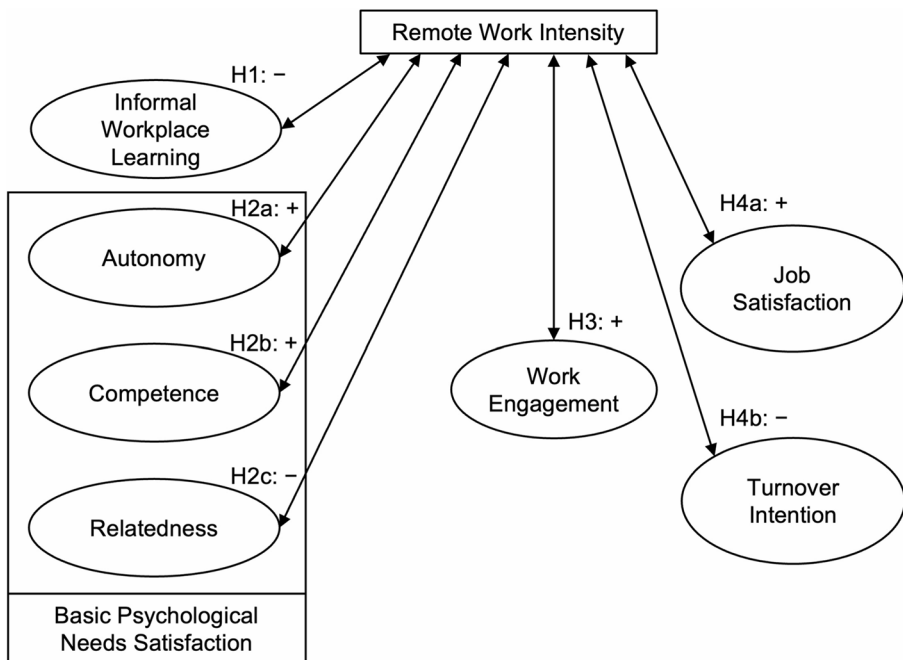
### **Job Satisfaction, Turnover Intention, and Remote Working**

Job satisfaction and turnover intention are commonly researched job attitudes that refer to general well-being and ill-being at work (Judge & Kammeyer-Mueller, 2012). In this study, job satisfaction refers to a global affective component of job satisfaction compared to more specific facets, such as satisfaction with work itself (Bowling & Hammond, 2008). Turnover intention, on the other hand, refers to "...a conscious and deliberate willfulness to leave the organization" (Tett & Meyer, 1993, p. 262) and can be used as a proxy for actual turnover. While considered primarily a negative job attitude, turnover intention can emerge from positive or neutral origins (e.g., high competence satisfaction in a competitive job market; see Van den Broeck et al., 2016). Turnover intention can be seen as being on the different end of continuum from job satisfaction (Puhakka et al., 2021).

A recent meta-analysis on studies conducted pre-pandemic and during pandemic found that RWI and remote work use (i.e., users vs. non-users of remote work) are both positively associated with job satisfaction and negatively with turnover intention (Gajendran et al., 2024). Based on the previous research we expect that RWI is positively associated with job satisfaction (H4a) and negatively with turnover intention (H4b). Visualization of the hypotheses for RQ1 is presented in Fig. 1.

### Modeling Learning and Well-being At Work

Although BPNS and informal workplace learning have been widely studied in work contexts (see e.g., Manuti et al., 2015; Van den Broeck et al., 2016), utilizing them to model the interrelations between BPNS, informal workplace learning and work well-being has been less common (e.g., Puhakka et al., 2021). For instance, the broader frameworks of well-being (e.g., JD-R; Bakker & Demerouti, 2017) and learning at work (Octagon model of informal workplace learning; Decius et al., 2019) often do not include BPNS (Nokelainen et al., 2023), or both well-being and learning factors together. Following this, modeling work well-being with informal workplace learning and relevant job outcomes can thus increase our understanding of these interrelated factors and their influence in work context. The increase in remote working introduces a novel component into the model, since remote working can have influence on several variables (e.g., increase in autonomy, decrease in informal interaction) and alter relationships between, for example, BPNS and job satisfaction (Brunelle &



**Fig. 1** Study Hypotheses for RQ1

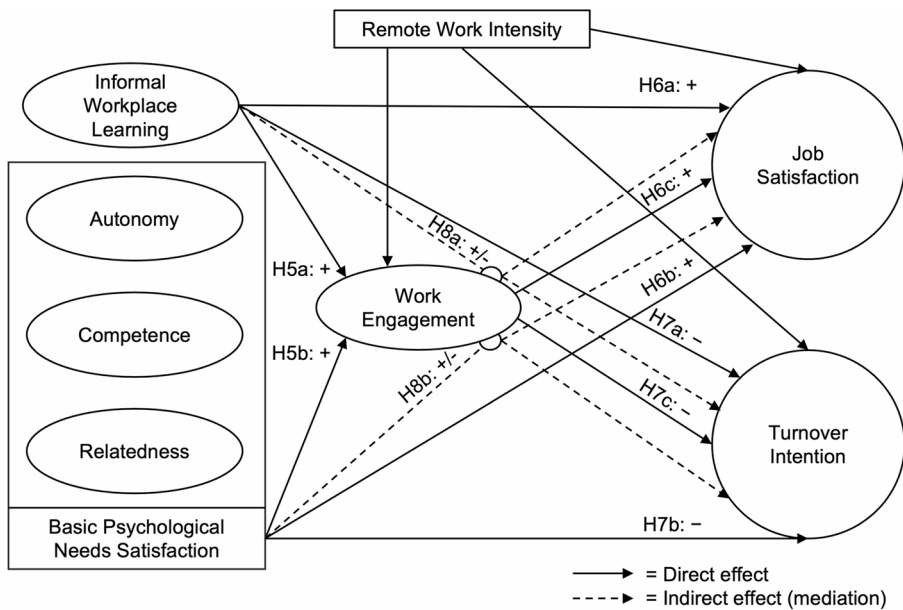
Note. + = expected positive association, - = expected negative association

Fortin, 2021). In addition, due to the complexity of these work-related phenomena and relationships, modeling techniques (e.g., Structural Equation Modeling, SEM; Hair et al., 2010) can enable more comprehensive examination of workplace learning and well-being.

We base our hypotheses related to RQ2 on the previous studies that have examined associations between learning, BPNS, work engagement, and job attitudes. Firstly, the studies have found that better opportunities for informal learning practices relate to higher work engagement (e.g., Susomrith & Coetzer, 2019). Similarly, more expansive learning opportunities have been associated with higher job satisfaction (e.g., Felstead et al., 2015; Lehtonen et al., 2022) and lower turnover intention (Govaerts et al., 2011). Higher perceived informal learning has also been associated with higher job satisfaction (Rowden & Conine, 2005). Based on this previous research, we expect that informal workplace learning is positively associated with work engagement (H5a) and job satisfaction (H6a) and negatively associated with turnover intention (H7a). Secondly, previous research indicates that BPNS is associated with higher work engagement (see Van den Broeck et al., 2016), and higher job satisfaction and lower turnover intention (Puhakka et al., 2021; Van den Broeck et al., 2016). We thus expect that BPNS has positive association with work engagement (H5b) and job satisfaction (H6b), and a negative association with turnover intention (H7b) in our model. Lastly, previous studies have found that work engagement is positively associated with job satisfaction (see Mazzetti et al., 2023; Yalabik et al., 2017) and negatively associated with turnover intention (see Mazzetti et al., 2023; Kim, 2017). Following this, we expect work engagement to relate positively to job satisfaction (H6c) and negatively to turnover intention (H7c).

Regarding RQ3, we first test a mediation effect of work engagement on the expected relationships between informal workplace learning and job satisfaction, and between informal learning and turnover intention (H8a). This hypothesis is based on the use of work engagement as a mediator between work-related factors (Schaufeli & Bakker, 2004; Yalabik et al., 2013) and the relationships between informal learning and job attitudes (Felstead et al., 2015; Govaerts et al., 2011; Lehtonen et al., 2022; Rowden & Conine, 2005; Susomrith & Coetzer, 2019). The second hypothesis related to RQ3 explores the mediation effect of work engagement on the expected relationships between BPNS and job satisfaction, and between BPNS and turnover intention (H8b). This hypothesis is based on the considerations that work engagement and BPNS play a role in the processes of JD-R model (Bakker & Demerouti, 2017), the mediator role of work engagement (Schaufeli & Bakker, 2004), and the relationships between BPNS and job attitudes (e.g., Puhakka et al., 2021; Van den Broeck et al., 2016).

Finally, RWI is included in the model to assess the effect of RWI on work engagement, job satisfaction, and turnover intention when the effects of BPNS and informal workplace learning are accounted for. Visualization of the SEM and hypotheses related to RQ2 and RQ3 is presented in Fig. 2.



**Fig. 2** Study Hypotheses for RQ2 and RQ3

Note. + = expected positive association, - = expected negative association. H8a and H8b consider mediation: from Informal Workplace Learning to Job Satisfaction and Turnover Intention mediated by Work Engagement (H8a) and from Basic Psychological Needs Satisfaction to Job Satisfaction and Turnover mediated by Work Engagement (H8b)

## Methods

### Participants and Procedure

The sample included 266 Finnish white-collar employees from an international IT (software consultant) company, which provides services such as strategic consulting, service design, software development, AI and analytics solutions, as well as cloud and integration services. The company invests in employees' well-being and has received recognitions and awards in this regard. The respondents recorded responses to at least one scale. The average age of the respondents was 39.7 ( $SD = 8.04$ ) years, and they had on average 15.9 ( $SD = 8.32$ ) years of work experience. The most common titles of the respondents were Software Designer ( $n=42$ , 15.8%), Data Engineer ( $n=28$ , 10.5%), Project Manager ( $n=25$ , 9.4%), Manager ( $n=21$ , 7.9%), and Integration Specialist ( $n=19$ , 7.1%). Most of the participants ( $n=162$ , 60.9%) identified as a man (woman  $n=96$ , 36.1%, other/prefer not to tell  $n=8$ , 3.0%). Most had completed higher-level university degree ( $n=170$ , e.g., master's degree, ISCED 7, 63.9%), next frequent was lower-level university degree ( $n=70$ , e.g., bachelor's degree, ISCED 6, 33.8%) followed by secondary level degree ( $n=20$ , 7.7%). Only a few had doctorate or equivalent degree (ISCED 8,  $n=6$ , 2.3%) and none had only basic level education.

Online survey (Limesurvey) was used to collect demographic information and responses to validated questionnaires from study participants. Link to the survey

was distributed via the company's internal channels to personnel ( $N=1040$ , response rate = 25.6%). The survey was active for three weeks and during that time two reminders were sent. Some participants ( $n=18$ ) answered the survey during Spring 2022 as a part of a sub study, while the remaining ( $n=248$ ) answered in Autumn 2022.

## Measures

We measured RWI from three different perspectives. We asked about the participants' *current* RWI: "On average, how many days during the week you currently work remotely (e.g., at home, in public spaces, etc.?)", RWI *before COVID-19 pandemic*: "On average, how many days during the week have you worked remotely (e.g., at home, in public spaces, etc.) before the COVID-19 pandemic", and *preferred* RWI: "On average, how many days during the week would you prefer to work remotely (e.g., at home, in public spaces, etc.?)". Kendall's tau-b ( $\tau_b$ ; Kendall & Gibbons, 1990) correlations showed significant associations between these different RWI perspectives. The high correlation between preferred RWI and current RWI ( $\tau_b=0.76$ ) suggests that employees enjoy considerable autonomy in shaping their current working arrangements and that the organization supports flexible remote work practices. Additionally, the positive associations between pre-pandemic RWI and both current ( $\tau_b=0.26$ ) and preferred ( $\tau_b=0.34$ ) RWI indicate that employees' historical remote work patterns influence their current behavior and future preferences. This may reflect a longer-term, internalized preference for remote work as well as the organization's responsiveness to evolving work modalities. From now on in the text, RWI refers to *current* RWI, which is used in the analysis to measure remote work intensity.

In addition to questions about demographic information and RWI, validated questionnaires were used in the survey to measure work well-being and informal learning (see Table 1 and Appendix).

## Statistical Analysis

Survey data were analyzed using the *R* statistical computing environment (R Core Team, 2020). Preliminary analyses included testing the univariate and multivariate normality of dependent variables (univariate skewness and kurtosis, and multivariate kurtosis) using the *MVN* package version 5.9 (Korkmaz et al., 2014). Means, standard deviations, Revelle's omega reliabilities (see McNeish, 2018), and Kendall's Tau-b correlations (Kendall & Gibbons, 1990) were calculated using the *psych* package version 2.3.6 (Revelle, 2024). The main analyses utilized modeling techniques, namely Confirmatory Factor Analysis (CFA) and SEM (Hair et al., 2010) which enable multivariate estimation of the latent variables (i.e., unobserved and indirectly measured concepts) and their relationships while accounting for measurement error in observed variables (Hair et al., 2021).

CFA was used to answer RQ1 (covariances between RWI and latent study variables). To answer RQ2 and RQ3, hypothesized associations of the variables were examined using SEM. The CFA and SEM analyses were conducted using the *lavaan* package version 0.6–16 (Rosseel, 2012). Following the recommendations, particularly for assessing indirect effects (e.g., Coutts & Hayes, 2023), bootstrapping (5000

**Table 1** Survey Scales

Scale	Citation	Measure	Items	Response scale
Informal workplace learning: Short measure for white-collar workers	Decius et al. (2023)	Informal workplace learning	8	1 = strongly disagree ... 5 = strongly agree
Basic Psychological Needs Scale-Revised (adapted)	Schultz et al. (2015)	Autonomy, competence, and relatedness satisfaction	12	1 = strongly disagree ... 5 = strongly agree
Ultra-short measure for work engagement	Schaufeli et al. (2019)	Work engagement	3	1 = never ... 5 = always
Michigan Organizational Assessment Questionnaire Job Satisfaction Subscale	Bowling and Hammond (2008)	Job satisfaction	3	1 = strongly disagree ... 5 = strongly agree
Turnover Intention Scale	Bothma and Roodt (2013)	Turnover intention	4	1 = never ... 5 = always

draws) was utilized for calculating standard errors for CFA and SEM. Package *semhelpinghands* version 0.1.12 (Cheung, 2024) was used to calculate bootstrap confidence intervals. Mediation (i.e., indirect effects) was investigated and established based on the typology by Zhao et al. (2010), which differentiates the types of mediation (complementary, competitive, and indirect-only) and non-mediation (direct-only, no-effect). Sufficiency of the sample size for the SEM analysis was examined by conducting power analysis using the *semPower* package version 2.1.0 (Moshagen & Bader, 2024).

The analyzed SEM model was constructed based on previous research (e.g., Mazzetti et al., 2023; Puhakka et al., 2021; Van den Broeck et al., 2016). In the model, informal workplace learning and the satisfaction of every basic psychological need (autonomy, competence, relatedness) were positively related to work engagement and job satisfaction and negatively related to turnover intention. In addition, we analyzed whether work engagement mediates the associations between informal workplace learning and job satisfaction, informal workplace learning and turnover intention, BPNS and job satisfaction, and BPNS and turnover intention. Finally, we included current RWI in the model to assess the influence of remote working.

### Preliminary Analysis

Of the participants who started the survey ( $n=286$ ), 258 responded to all scales (full respondents) and eight responded to at least one scale (partial respondents). Multivariate and univariate normality of dependent variables were violated (multivariate kurtosis = 8.33,  $p < .001$ ). Due to these deviations, we used full information maximum

likelihood (FIML) approach and an estimator with robust (Huber-White) standard errors and a scaled test statistic (MLR) in the SEM analysis. The final data used in the analysis thus included both full and partial respondents ( $n=266$ ). Distinct and extreme multivariate outliers were not observed. As there was no evidence of erroneous responses or input errors and a robust estimator was used, outlier removal was not conducted (see e.g., Karch, 2023; Stevens, 2012).

For the CFA (RQ1) and SEM (RQ2 and RQ3) analyses, model fit was assessed by the scaled chi-squared test and by examining the following three robust fit indices (as recommended by Kline, 2016): Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). Commonly used cut-off values for excellent and acceptable fit, respectively, are the following:  $CFI \geq 0.95/0.90$ ,  $RMSEA \leq 0.06/0.08$ ,  $SRMR \leq 0.08/0.08$  (Hu & Bentler, 1999; Marsh et al., 2005).

## Measurement Model

A measurement model including latent variables of informal workplace learning (8 items), satisfaction of basic psychological need for autonomy (4 items), competence (4 items), and relatedness (4 items), work engagement (3 items), job satisfaction (3 items), turnover intention (4 items), and remote work intensity (1 item) was analyzed using CFA. This original measurement model resulted in a not positive definite covariance matrix. This often occurs when items or constructs are highly collinear, necessitating model adjustments such as removing correlated items or modifying factor specifications. After inspection, the fourth item in turnover intention scale (TI\_4: “How often do you look forward to another day at work?”; see Appendix) was identified as the issue and was removed. Following this, a CFA for the model without TI\_4 showed a poor fit:  $\chi^2(378)=719.99$ ,  $p<.001$ ;  $RMSEA=0.062$  (90% CI[0.055, 0.069],  $p=.004$ );  $CFI=0.905$ ;  $SRMR=0.067$ . Factor loadings ranged from 0.35 to 0.91. To improve the model, the item with the distinctly low factor loading (0.35), the first item of the intent to learning -dimension of the informal workplace learning scale (IWL\_I2: “I want to learn something new at work for myself because then I can pursue my career at the company”) was removed and one modification based on the examination of modification indices was applied: Allowing the residual covariance between the fourth item of autonomy satisfaction scale (AUT\_4: “I feel I have been doing what really interests me in my job”) and the second item of work engagement scale (WE\_2: “I am enthusiastic about my job”). The modified measurement model had an acceptable fit:  $\chi^2(349)=595.74$ ,  $p<.001$ ;  $RMSEA=0.055$  (90% CI[0.047, 0.062],  $p=.168$ );  $CFI=0.930$ ;  $SRMR=0.064$ . Factor loadings ranged from 0.47 to 0.91, indicating generally acceptable to strong relationships between items and their respective latent constructs.

## Results

Table 2 presents the means, standard deviations, scale reliabilities (Revelle’s omega;  $\Omega$ ), and Kendall’s Tau-b ( $\tau_b$ ) correlations for the study variables.

**Table 2** Descriptive Statistics, Revelle's Omega Reliabilities, and Bivariate Kendall's Tau-b Correlations

	<i>M</i>	<i>SD</i>	$\omega$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1. <i>IWL</i>	4.00	0.53	0.76	—																
2. Experience/Action	3.97	0.73	—	<b>0.55</b>	—															
3. Feedback	3.70	0.81	—	<b>0.64</b>	<b>0.30</b>	—														
4. Reflection	3.95	0.75	—	<b>0.64</b>	<b>0.34</b>	<b>0.37</b>	—													
5. Intent to learn	4.36	0.66	—	<b>0.50</b>	<b>0.16</b>	<b>0.29</b>	<b>0.29</b>	—												
6. <i>BPNS</i>	4.03	0.58	0.89	<b>0.34</b>	<b>0.36</b>	<b>0.28</b>	<b>0.18</b>	<b>0.17</b>	—											
7. Autonomy	4.05	0.69	0.83	<b>0.32</b>	<b>0.30</b>	<b>0.23</b>	<b>0.17</b>	<b>0.22</b>	<b>0.67</b>	—										
8. Competence	4.16	0.69	0.91	<b>0.26</b>	<b>0.28</b>	<b>0.21</b>	<b>0.18</b>	<b>0.14</b>	<b>0.58</b>	<b>0.35</b>	—									
9. Relatedness	3.87	0.81	0.90	<b>0.25</b>	<b>0.28</b>	<b>0.22</b>	0.12	0.10	<b>0.67</b>	<b>0.42</b>	<b>0.27</b>	—								
10. Work engagement	3.61	0.75	0.82	<b>0.34</b>	<b>0.26</b>	<b>0.29</b>	<b>0.21</b>	<b>0.23</b>	<b>0.45</b>	<b>0.47</b>	<b>0.35</b>	<b>0.29</b>	—							
11. Job satisfaction	4.37	0.66	0.85	<b>0.29</b>	<b>0.23</b>	<b>0.28</b>	<b>0.13</b>	<b>0.20</b>	<b>0.58</b>	<b>0.54</b>	<b>0.35</b>	<b>0.48</b>	<b>0.49</b>	—						
12. Turnover intention	2.28	0.73	0.70	<b>-0.23</b>	<b>-0.20</b>	<b>-0.20</b>	<b>-0.09</b>	<b>-0.17</b>	<b>-0.46</b>	<b>-0.46</b>	<b>-0.26</b>	<b>-0.35</b>	<b>-0.45</b>	<b>-0.61</b>	—					
13. Age	39.73	8.04	—	0.00	0.01	0.03	0.05	-0.09	0.04	-0.07	0.13	0.04	0.03	-0.01	0.08	—				
14. Gender <sup>a</sup>	—	—	—	<b>-0.14</b>	<b>-0.09</b>	<b>-0.17</b>	<b>-0.03</b>	<b>-0.09</b>	<b>-0.06</b>	<b>-0.09</b>	<b>0.03</b>	<b>-0.08</b>	<b>-0.03</b>	<b>-0.07</b>	<b>0.04</b>	<b>0.06</b>	—			
15. Education	—	—	—	0.01	0.01	0.04	0.02	-0.03	<b>0.13</b>	0.10	0.12	0.07	-0.02	0.08	0.00	0.02	<b>-0.13</b>	—		
16. Work experience	15.90	8.32	—	0.01	0.02	0.02	0.06	-0.08	0.04	-0.08	<b>0.16</b>	0.04	0.04	-0.03	0.08	<b>0.78</b>	0.00	-0.01	—	
17. RWI	3.06	1.64	—	0.05	-0.06	0.05	0.07	0.09	-0.11	-0.05	0.01	<b>-0.18</b>	0.05	-0.08	0.02	-0.01	0.02	-0.11	-0.02	—

Kendall's tau-b correlation (Kendall & Gibbons, 1990) cutoffs:  $\tau_b > |0.06|$  weak association,  $\tau_b > |0.19|$  moderate association,  $\tau_b > |0.33|$  strong association (Walker, 2003)

*BPNS* basic psychological needs satisfaction, *IWL* informal workplace learning, *RWI* remote work intensity,  $\omega$  reliability (Revelle's omega; see McNeish, 2018)

<sup>a</sup> 1 = woman, 2 = man. Bolded values indicate statistical significance ( $p < .05$ )

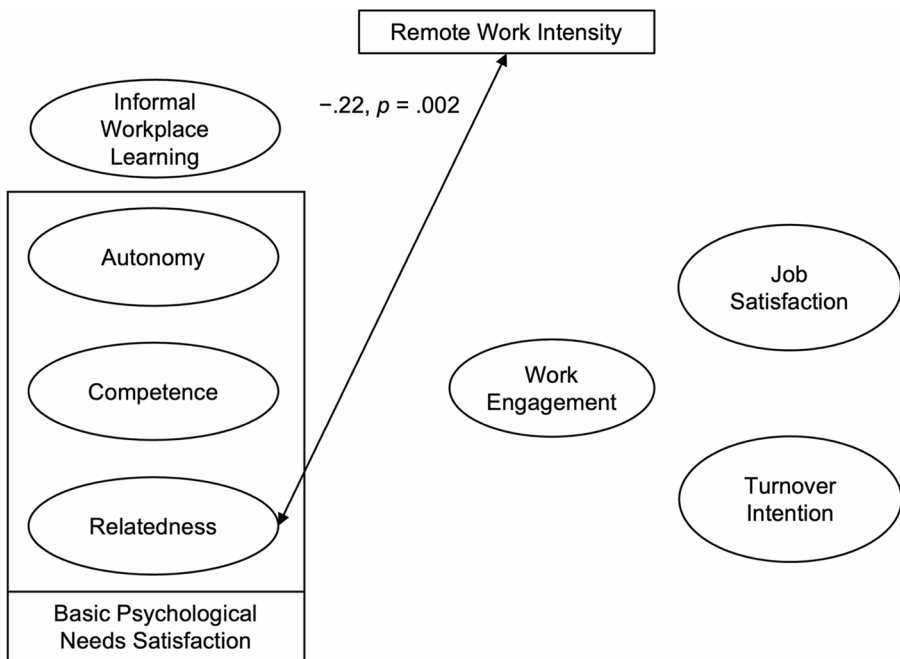
## Covariances between RWI and Study Variables

For RQ1, the CFA results showed that RWI was not significantly associated with informal workplace learning ( $\sigma=0.08$ ,  $SE=0.08$ ,  $p=.274$ , 95% CI  $[-0.06, 0.23]$ ), which did not support our H1. RWI was not significantly associated with autonomy ( $\sigma = -0.03$ ,  $SE=0.07$ ,  $p=.692$ , 95% CI  $[-0.17, 0.11]$ ), or competence satisfaction ( $\sigma = -0.02$ ,  $SE=0.06$ ,  $p=.738$ , 95% CI  $[-0.14, 0.10]$ ), which was against H2a and H2b. However, RWI was significantly negatively associated with relatedness satisfaction supporting our H2c ( $\sigma = -0.22$ ,  $SE=0.07$ ,  $p=.002$ , 95% CI  $[-0.35, -0.08]$ ). Finally, contrary to our expectations, RWI was not significantly associated with work engagement (H3;  $\sigma=0.04$ ,  $SE=0.08$ ,  $p=.585$ , 95% CI  $[-0.10, 0.19]$ ), job satisfaction (H4a;  $\sigma = -0.03$ ,  $SE=0.07$ ,  $p=.689$ , 95% CI  $[-0.17, 0.11]$ ), or turnover intention (H4b;  $\sigma = -0.04$ ,  $SE=0.07$ ,  $p=.587$ , 95% CI  $[-0.18, 0.10]$ ). Visualization of statistically significant covariances between RWI and study variables is presented in Fig. 3.

## SEM

The measurement model for the SEM (RQ2 and RQ3) was identical compared to the measurement model used by the previous CFA (RQ1) apart from the exclusion of RWI (1 item), which was included as a predictor in the SEM. The hypothesized SEM model showed acceptable fit to the data:  $\chi^2(353)=614.73$ ,  $p<.001$ ; RMSEA=0.056 (90% CI  $[0.049, 0.064]$ ,  $p=.088$ ); CFI=0.925; SRMR=0.069. Similarly to the measurement model, in the SEM model, we allowed the correlation between the unexplained (error) parts of the fourth autonomy satisfaction item (AUT4: “I feel I have been doing what really interests me in my job”) and the second work engagement item (WE2: “I am enthusiastic about my job”) based on modification indices. The a priori power analysis of the model (using  $\alpha=0.05$ ,  $\text{power}=0.80$ ,  $\text{RMSEA}<0.06$ , and  $\text{df}=353$ ) resulted in the required sample size of 58 which was clearly exceeded ( $n=260$ ).

Standardized SEM results for RQ2 and RQ3 are presented in Table 3 and statistically significant paths are visualized in Fig. 4. Informal workplace learning was significantly positively related to work engagement ( $\beta=0.19$ ,  $p=.039$ , 95% CI  $[0.02, 0.36]$ ; H5a) but not to job satisfaction (H6a) or turnover intention (H7a). Autonomy satisfaction was significantly positively related to work engagement ( $\beta=0.62$ ,  $p<.001$ , 95% CI  $[0.43, 0.79]$ ; H5b) and job satisfaction ( $\beta=0.33$ ,  $p=.006$ , 95% CI  $[0.11, 0.55]$ ; H6b), but only marginally negatively related to turnover intention ( $\beta = -0.28$ ,  $p=.062$ , 95% CI  $[-0.57, 0.00]$ ; H7b). Competence satisfaction, contrary to our expectations, was not significantly related to work engagement (H5b), job satisfaction (H6b), or turnover intention (H7b). Relatedness satisfaction was significantly positively related to job satisfaction ( $\beta=0.31$ ,  $p<.001$ , 95% CI  $[0.15, 0.46]$ ) and negatively related to turnover intention ( $\beta = -0.36$ ,  $p=.001$ , 95% CI  $[-0.55, -0.16]$ ), supporting H6b and H7b. Work engagement was significantly positively related to job satisfaction ( $\beta=0.42$ ,  $p<.001$ , 95% CI  $[0.18, 0.62]$ ; H6c) and negatively related to turnover intention ( $\beta = -0.33$ ,  $p=.007$ , 95% CI  $[-0.54, -0.07]$ ; H7c). In accordance with the CFA results from RQ1, RWI was not significantly associated with work



**Fig. 3** Graphical Representation of the Results for RQ1

Note. Only statistically significant ( $p < .05$ ) estimates ( $\sigma$ ) are displayed

engagement or job satisfaction, and only marginally negatively associated with turnover intention ( $\beta = -0.11, p = .084, 95\% \text{ CI} [-0.23, 0.01]$ ).

### Mediation Effects

There was a significant positive indirect effect from informal workplace learning via work engagement to job satisfaction ( $\beta = 0.08, p = .042, 95\% \text{ CI} [0.01, 0.16]$ ), while the direct effect from informal workplace learning to job satisfaction was nonsignificant. This indicates an indirect-only mediation, which is in line with our H8. A negative marginal indirect effect from informal workplace learning via work engagement to turnover intention was observed ( $\beta = -0.06, p = .077, 95\% \text{ CI} [-0.14, 0.00]$ ), similarly without direct effect from informal workplace learning to turnover intention.

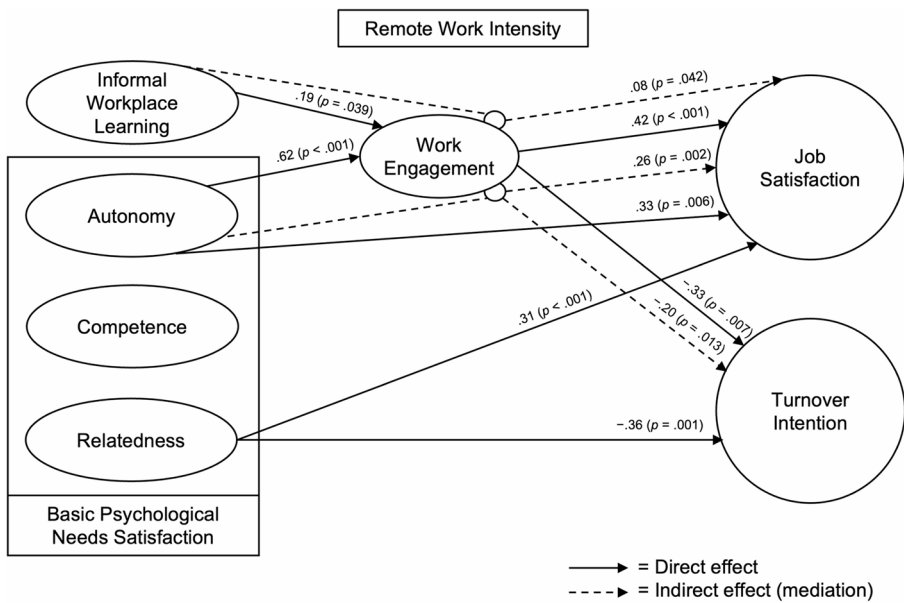
Regarding H8b, a significant indirect effect from autonomy satisfaction via work engagement to job satisfaction ( $\beta = 0.26, p < .001, 95\% \text{ CI} [0.10, 0.42]$ ) was observed together with a significant direct effect from autonomy satisfaction to job satisfaction, indicating a complementary mediation. Furthermore, a negative indirect effect from autonomy satisfaction via work engagement to turnover intention was found ( $\beta = -0.20, p = .013, 95\% \text{ CI} [-0.36, -0.04]$ ) with only marginal direct effect between autonomy satisfaction and turnover intention. This indicates an indirect-only mediation but with a relatively substantial direct effect from autonomy satisfaction. These results support our H8b in terms of autonomy. Relatedness satisfaction had only significant direct effects on job satisfaction and turnover intention indicating that

**Table 3** Standardized Direct, Indirect, and Total Effects of the SEM Model

	$\beta$	95% CI		SE	p
		LL	UL		
<i>Direct effects to work engagement</i>					
<i>Informal workplace learning</i>	0.19*	0.02	0.36	0.09	.039
<i>Autonomy satisfaction</i>	0.62***	0.43	0.79	0.09	<.001
<i>Competence satisfaction</i>	0.09	-0.06	0.25	0.08	.253
<i>Relatedness satisfaction</i>	-0.01	-0.16	0.13	0.07	.848
<i>Remote work intensity</i>	0.04	-0.06	0.15	0.05	.425
<i>Direct effects to job satisfaction</i>					
<i>Informal workplace learning</i>	-0.04	-0.21	0.12	0.08	.633
<i>Autonomy satisfaction</i>	0.33**	0.11	0.55	0.11	.006
<i>Competence satisfaction</i>	-0.01	-0.14	0.13	0.07	.855
<i>Relatedness satisfaction</i>	0.31***	0.15	0.46	0.08	<.001
<i>Work engagement</i>	0.42***	0.18	0.62	0.11	<.001
<i>Remote work intensity</i>	0.03	-0.07	0.12	0.05	.573
<i>Direct effects to turnover intention</i>					
<i>Informal workplace learning</i>	0.17	-0.06	0.38	0.11	.166
<i>Autonomy satisfaction</i>	-0.28	-0.57	0.00	0.14	.062
<i>Competence satisfaction</i>	0.00	-0.17	0.17	0.09	.961
<i>Relatedness satisfaction</i>	-0.36**	-0.55	-0.16	0.10	.001
<i>Work engagement</i>	-0.33**	-0.54	-0.07	0.12	.007
<i>Remote work intensity</i>	-0.11	-0.23	0.01	0.06	.084
<i>Indirect effects to job satisfaction via work engagement</i>					
<i>Total indirect</i>	0.37***	0.16	0.54	0.09	<.001
<i>Specific indirect from informal workplace learning</i>	0.08*	0.01	0.16	0.04	.042
<i>Specific indirect from autonomy satisfaction</i>	0.26**	0.10	0.42	0.08	.002
<i>Specific indirect from competence satisfaction</i>	0.04	-0.03	0.11	0.03	.272
<i>Specific indirect from relatedness satisfaction</i>	-0.01	-0.07	0.05	0.03	.848
<i>Indirect effects to turnover intention via work engagement</i>					
<i>Total indirect</i>	-0.29**	-0.49	-0.06	0.11	.007
<i>Specific indirect from informal workplace learning</i>	-0.06	-0.14	0.00	0.04	.077
<i>Specific indirect from autonomy satisfaction</i>	-0.20*	-0.36	-0.04	0.08	.013
<i>Specific indirect from competence satisfaction</i>	-0.03	-0.10	0.02	0.03	.302
<i>Specific indirect from relatedness satisfaction</i>	0.01	-0.04	0.06	0.03	.848
<i>Total effects to job satisfaction</i>	0.95***	0.80	1.08	0.07	<.001
<i>Total effects to turnover intention</i>	-0.76***	-0.92	-0.59	0.08	<.001

$\beta$  standardized estimate, SE standard error CI confidence interval, LL lower limit, UL upper limit

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



**Fig. 4** Graphical Representation of the Results for RQ2 and RQ3

Note. Only statistically significant ( $p < .05$ ) paths and standardized estimates ( $\beta$ ) are displayed

work engagement does not mediate the associations between relatedness satisfaction and job satisfaction, and turnover intention. Summary of the study hypotheses and whether the results support them are listed in Table 4.

## Discussion

This study aimed, first, to investigate the association between RWI, informal learning activities, and well-being at work, and second, to examine the relation of informal workplace learning and BPNS to work engagement, job satisfaction, and turnover intention in the post-pandemic IT sector context. The results revealed unexpected findings regarding RWI, while the SEM results between workplace learning and well-being generally aligned with our expectations.

Table 5 summarizes the expected associations based on the hypotheses, observed associations, and whether the results provide support for the set hypotheses. The results considering RWI (RQ1) provided little support for the H1-H4 hypotheses as the covariances between RWI and study variables were nonsignificant excluding relatedness satisfaction. Regarding the observed weak relationship between RWI and informal workplace learning (H1), a possible explanation pertains to the use of digital collaboration and communication tools in supporting learning when remote working frequently (Jackson et al., 2022). There are indications that RWI can challenge but also create opportunities for learning and development (e.g., Lehtonen E, Rintala H, Puhakka I, Nokelainen P: A typology of approaches to professional learning and development in post-pandemic multi-location knowledge work in the technology

**Table 4** Study Hypotheses and Support From Analysis

Hypothesis	Association	Expected association	Observed association (covariance)	Observed predictor in SEM analysis	Support for hypothesis
<b>RQ1</b>					
H1	RWI-IWL	–	+ (NS)	NA	no
H2a	RWI-AUT	+	– (NS)	NA	no
H2b	RWI-COM	+	– (NS)	NA	no
H2c	RWI-REL	–	–	NA	yes
H3	RWI-WE, RWI->WE	+	+ (NS)	+ (NS)	partial
H4a	RWI-JS, RWI->JS	+	– (NS)	+ (NS)	partial
H4b	RWI-TI, RWI->TI	–	– (NS)	– (NS)	partial
<b>RQ2</b>					
H5a	IWL->WE	+	+	+	yes
H5b	BPNS->WE	+	+	+	yes
H6a	IWL->JS	+	+	– (NS)	no
H6b	BPNS->JS	+	+	+	yes
H6c	WE->JS	+	+	+	yes
H7a	IWL->TI	–	–	+ (NS)	no
H7b	BPNS->TI	–	–	–	yes
H7c	WE->TI	–	–	–	yes
<b>RQ3</b>					
H8a	Mediation1	+/-	NA	+	yes
H8b	Mediation2	+/-	NA	–	yes

“+” indicates positive association, “–” indicates negative association, bolded symbols indicate observed associations analyzed for hypotheses

NS nonsignificant, NA not analyzed, RWI remote work intensity, IWL informal workplace learning, AUT autonomy satisfaction, COM competence satisfaction, REL relatedness satisfaction, WE work engagement, JS job satisfaction, TI turnover intention, BPNS basic psychological needs satisfaction

sector, submitted). Moreover, leadership and management can provide remedies to these challenges (Mühlenbrock et al., 2023). Further research on the factors that contribute to successful high RWI work is thus needed, particularly related to optimal leadership practices.

For BPNS, only relatedness satisfaction was significantly negatively associated with RWI (H2c). This result is in line with previous research (Kesenheimer et al., 2025; Peijen et al., 2024). Considering the lack of significant associations between RWI, autonomy (H1a), and competence satisfaction (H2b), one possible explanation could be the organizational culture of the company: Participants’ current RWI aligned closely with the preferred RWI ( $\tau_b = 0.76$ ). This alignment can support BPNS of employees working with both high and low RWI. In addition, the increase in RWI can be seen to influence particularly relatedness, as social interactions are central to relatedness satisfaction (Gagné et al., 2022; Chen et al., 2015). These results follow the research indicating that remote working influences learning in work interaction situations and work in general by altering social interaction (Lehtonen E, Rintala H, Puhakka I, Nokelainen P: A typology of approaches to professional learning and

development in post-pandemic multi-location knowledge work in the technology sector, submitted; Lemmetty, 2024).

In terms of work engagement (H3), the association between RWI and work engagement was weak and nonsignificant in both CFA and SEM. This aligns with the generally weak association found in the meta-analysis by Gajendran et al. (2024). Previously mentioned flexible organizational culture related to remote working and the nonlinear relationship between RWI and work engagement can explain this result. Further investigation of the ways that work engagement can be supported in high or low RWI should be undertaken, with a focus on the structures and practices that employees and organizations can utilize.

For job satisfaction (H4a) and turnover intention (H4b), covariances with RWI were nonsignificant but in SEM, RWI was marginally negatively related to turnover intention. These results align more with studies reporting ambiguous relationships between remote working and these job attitudes (e.g., Golden, 2006), compared to more recent research synthesis (e.g., Gajendran et al., 2024). The autonomy in choosing the levels of RWI might explain these weak associations, as employees' job satisfaction and turnover intention are less dependent on their preference for RWI. Limited to a sample from a single IT sector company, the present study results encourage further research on the factors that support job satisfaction and lower turnover intention in high RWI settings.

The results mostly supported our hypotheses regarding RQ2 and RQ3, which indicates that the increase in multilocal and remote working has not fundamentally changed the dynamics of learning and well-being in knowledge work. In addition, RWI was not a significant predictor of work engagement, job satisfaction, nor turnover intention, agreeing with the results from the CFA (RQ1). An interesting result from the SEM analysis considers the association of informal workplace learning to job satisfaction. While being significantly positively associated with only work engagement directly, informal workplace learning had a significant positive indirect-only effect on job satisfaction. This indicates that while BPNS can have a higher impact on job attitudes compared to informal workplace learning, informal workplace learning can still enhance job satisfaction but only via work engagement. This result follows previous studies suggesting that, for example, workplace learning opportunities might not directly relate to job attitudes when examined together with BPNS (Puhakka et al., 2021). As BPNS and work engagement have been considered to play a role in the processes of the JD-R model (Bakker & Demerouti, 2017), the present study suggests that informal workplace learning, and other learning-related factors can have an influence on these processes as well.

Regarding BPNS, autonomy satisfaction was a significant positive predictor of job satisfaction and work engagement and a marginal negative predictor of turnover intention. Moreover, while considered to have more of a secondary influence on some outcomes compared to autonomy (Ryan & Deci, 2017), relatedness satisfaction had significant positive associations to job satisfaction and turnover intention comparable to autonomy satisfaction. The strong direct and indirect effects of autonomy satisfaction on job satisfaction (complementary mediation) and turnover intention (indirect-only) follow the idea of autonomy satisfaction being a prominent factor in work well-being (Ryan & Deci, 2017). This can be particularly important in knowl-

edge work as flexibility and variability of work tasks enable increased autonomy and possibilities to influence one's own work benefitting both development and performance of employees. Interestingly, work engagement did not mediate the associations between relatedness satisfaction and job attitudes. This result reveals how autonomy and relatedness satisfaction have different roles in work: Relatedness contributes in a more direct way to job attitudes, while the effects of autonomy are more complex. Going forward, it would be interesting to explore how autonomy and relatedness satisfaction are emphasized across different work populations and relationships of outcomes, in addition to how remote and multilocal working influence these processes. Additionally, complementary mediation between autonomy satisfaction and job satisfaction calls for identifying other possible mediators to provide a more accurate picture of factors influencing job satisfaction.

One distinct result, which was contrary to our expectations, was that competence satisfaction had no significant associations with work engagement, job satisfaction, or turnover intention. This can stem from the previously mentioned availability of digital resources but also from the notions that autonomy and relatedness satisfaction have higher impact especially on turnover intention and work engagement compared to competence satisfaction (Van den Broeck et al., 2016). IT sector context can be a factor in the results having high voluntary and nonvoluntary turnover rates. Career paths and expectations for career development can thus differ from the traditional preferences of permanent, stable positions. Indications of the presence of these more complex phenomena come from the studies that link competence satisfaction (Puhakka et al., 2021; Van den Broeck et al., 2016) or subjective career satisfaction (Lehtonen et al., 2022) to higher turnover intention.

The observed weak or nonexistent associations between RWI and informal workplace learning and well-being indicators (apart from relatedness satisfaction) raise questions about the magnitude of the impact of RWI in knowledge work. Longitudinal research on the effects of remote and multilocal work on well-being and learning at work should be undertaken to investigate these possible prevailing and multifaceted effects.

## Practical Implications

The results imply that organizations should provide autonomy and encourage informal workplace learning (e.g., by improving feedback culture) to improve employees' well-being at work. The study results highlight particularly the role of relatedness satisfaction in current multilocal work and thus encourage focusing on and developing community, alongside with relatedness increasing policies and activities. Emphasizing autonomy while maintaining relatedness is an important notion in contemporary IT sector work due to the high prevalence of remote and hybrid working. Enhancing work engagement via proactive management and job crafting methods (Bakker & Demerouti, 2017) can support learning and well-being by influencing various levels and pathways within work. Furthermore, getting familiarized with remote working preferences of both individual employees, but also teams can provide organizations with important information to discuss and reach an agreement that considers the needs from all parties. This supports the alignment of current and pre-

ferred RWI and can thus improve learning and well-being outcomes for all employees regardless of their RWI. Following this, the results imply that there are various factors that contribute to the benefits and hindrances of remote working. Therefore, broad conclusions that hybrid working is distinctly superior, or inferior compared to on-site office working should be avoided and instead, individualized examination of organization or team level factors should be conducted.

Recently, organizations have started to unilaterally restrict opportunities for remote working due to concerns about its negative effects. The study results and recent research (e.g., Gajendran et al., 2024; Kesenheimer et al., 2025; Peijen et al., 2024) urge organizations to instead engage in discussions with the employees to find an optimal balance. This is particularly important in the IT sector, where the digital potential in both technology- and skill-wise are high, and where flexible leadership culture can enable timely and multilateral decision-making.

## Limitations

Certain limitations are warranted due to the study's sample and data characteristics. *Firstly*, the cross-sectional nature of the survey data used in the analysis prevents making causal interpretations of the results. *Secondly*, the study participants were white-collar employees from a single company in the IT sector, where continuous learning and development are essential, thus further investigations in different industries and work cultures are needed to obtain a more comprehensive picture of current knowledge work. IT sector employees are expected to be skilled in using digital tools and thus the impact of increasing need and utilization of digital skills and digitalization of learning and professional development in work (Wallin et al., 2020) can have limited effect compared to employees in other fields. *Thirdly*, while the sample size was sufficient for the mediation SEM analysis, internal consistency values of the turnover intention scale were marginal and further covariances created issues with analysis that required item omission. Due to these issues with the scale, interpretations regarding turnover intention results should be made with caution. *Fourthly*, some of the intercorrelations of the informal workplace learning questionnaire were quite low, which calls for caution when interpreting the results from informal workplace learning. Future studies could use the longer version to enable more in-depth examination of different components and should also further investigate the validity of the shortened version of the questionnaire. *Fifthly*, remote working was measured only by self-reported average frequency of remote working days per week. This hides the possible variations of RWI over time or based on work tasks and phases, as well as possible moderating factors that might influence the relationship between remote work frequency and study variables (e.g., available technology, remote working spaces, ergonomics). In addition, participants' employment status (full- of part-time) was not asked in the survey. While RWI can be expected to behave relatively similarly with both full- and part-time work (as the study measures focus on the work context), we recommend that future research should explicitly account for total weekly hours or part-time status to more precisely interpret the effect of RWI.

## Conclusion

The importance of relatedness satisfaction in relation to RWI encourages the companies and organizations in the IT sector to invest in community culture, particularly of those who work (and prefer to work) frequently remotely. In general, the organizations should provide autonomy and encourage informal workplace learning (e.g., improving feedback culture) to improve employees' well-being at work. Theoretically, the results indicate that BPNS has a relatively higher impact on job satisfaction and turnover intention in the IT sector knowledge work context over informal workplace learning. Nevertheless, informal workplace learning can still enhance job satisfaction through high work engagement. Taken together the study results imply that intensity of remote working is not distinctly beneficial or detrimental for employee learning and well-being, however, hybrid work may be preferable in supporting learning and well-being at work compared to full-time remote working.

## Appendix

Scales, subscales, and items	Code	<i>M</i> ( <i>SD</i> )
Informal workplace learning activities ( $\omega=0.76$ )	IWL	4.00 (0.53)
<i>Experience/action</i>	IWL_E	3.97 (0.73)
I use my own ideas to improve tasks at work.	IWL_E1	4.03 (0.83)
I look at how others work in the company to improve my work.	IWL_E2	3.92 (0.98)
<i>Feedback</i>	IWL_F	3.70 (0.81)
I ask my colleagues when I am not sure how well I worked.	IWL_F1	3.42 (1.05)
I ask my colleagues about the methods and tricks they use at work.	IWL_F2	3.98 (0.84)
<i>Reflection</i>	IWL_R	3.95 (0.75)
Before starting a new task, I think about how I can do my work best.	IWL_R1	4.05 (0.84)
When I have finished a new task, I think about what I still could do better next time.	IWL_R2	3.84 (0.88)
<i>Intent to learn</i>	IWL_I	4.36 (0.66)
I want to learn something new at work for myself because then I can pursue my career at the company.	IWL_I1	4.20 (0.93)
I want to learn something new for myself because then I can solve problems at work faster.	IWL_I2	4.52 (0.64)
Basic psychological needs satisfaction ( $\omega=0.89$ )	BPNS	4.03 (0.58)
<i>Autonomy satisfaction</i> ( $\omega=0.83$ )	AUT	4.05 (0.69)
At work, I feel a sense of choice and freedom in the things I undertake.	AUT_1	4.39 (0.78)
I feel that my decisions on my job reflect what I really want.	AUT_2	3.92 (0.84)
I feel my choices on my job express who I really am.	AUT_3	3.91 (0.90)
I feel I have been doing what really interests me in my job.	AUT_4	3.99 (0.91)
<i>Competence satisfaction</i> ( $\omega=0.91$ )	COM	4.16 (0.69)
I feel confident that I can do things well on my job.	COM_1	4.16 (0.74)
At work, I feel capable at what I do.	COM_2	4.11 (0.79)
When I am at work, I feel competent to achieve my goals.	COM_3	4.21 (0.75)
In my job, I feel I can successfully complete difficult tasks.	COM_4	4.14 (0.82)

Scales, subscales, and items	Code	<i>M</i> ( <i>SD</i> )
<i>Relatedness satisfaction</i> ( $\omega=0.90$ )	REL	3.87 (0.81)
I feel that the people I care at work about also care about me.	REL_1	4.06 (0.89)
I feel connected with people who care for me at work, and for whom I care at work.	REL_2	4.00 (0.91)
At work, I feel close and connected with other people who are important to me.	REL_3	3.72 (0.98)
I experience a warm feeling with the people I spend time with at work.	REL_4	3.71 (0.95)
<i>Work engagement</i> ( $\omega=0.82$ )	WE	3.61 (0.75)
I use my own ideas to improve tasks at work.	WE_1	3.38 (0.87)
I look at how others work in the company to improve my work.	WE_2	3.76 (0.87)
I ask my colleagues when I am not sure how well I worked.	WE_3	3.69 (0.89)
<i>Job satisfaction</i> ( $\omega=0.85$ )	JS	4.37 (0.66)
All in all, I am satisfied with my job.	JS_1	4.15 (0.82)
In general, I don't like my job.	JS_2	1.40 (0.69)
In general, I like working here.	JS_3	4.36 (0.74)
<i>Turnover intention</i> ( $\omega=0.70$ )	TI	2.28 (0.73)
How often are you frustrated when not given the opportunity at work to achieve your personal work-related goals?	TI_1	2.32 (1.06)
How often are your personal values at work compromised?	TI_2	1.86 (0.91)
How often do you dream about getting another job that will better suit your personal needs?	TI_3	2.15 (1.14)
How often do you look forward to another day at work?	TI_4	3.22 (0.96)

$\omega$  Scale reliability (Revelle's omega; see McNeish, 2018)

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**Data Availability** The survey data used in this study will be anonymized and submitted to the Finnish Social Science Data Archive 10 years after the end of the research project (2033) and opened for further research use.

## Declarations

**Ethics Approval and Consent to Participate** Before data collection, a favorable statement for the study was obtained from the Ethics Committee of the Tampere Region [statement: 25/2022].

**Competing Interests** Non-financial interests: Petri Nokelainen is an editorial board member of *Vocations and Learning*.

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