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The Influence of Remote Work on Personality Trait–Performance Linkages: A Two-Wave Longitudinal Study

Espen Olsen [1], Yusheng Fu [2] and Maria Therese Jensen [3,*]

[1] UiS Business School, University of Stavanger, 4021 Stavanger, Norway; espen.olsen@uis.no
[2] Nottingham Business School, Nottingham Trent University, Nottingham NG1 4FQ, UK; yusheng.fu@ntu.ac.uk
[3] Norwegian Reading Centre, University of Stavanger, 4021 Stavanger, Norway
* Correspondence: maria.t.jensen@uis.no

Abstract: Few studies have investigated how remote work influences personality trait–performance linkages over time in heterogeneous work populations. Hence, the aim of this study was twofold: (1) to explore the predictive validity personality traits have on work behaviour (work engagement and innovative work behaviour) and occupational health outcomes (general health and sick leave); (2) to explore how remote work potentially moderates the trait–performance linkage. Panel survey data from a Norwegian work–life barometer panel research project was employed, and the time lag was one year. The results indicated that the Big Five was consistently related to work behaviour and occupational health outcomes. Extraversion had the strongest positive association with work engagement (0.25), innovative work behaviour (0.26) and general health (0.17), while neuroticism had the strongest negative association with work engagement (−0.16), general health (−0.21), and sick leave (−0.23). Agreeableness increases the risk of sick leave (0.11), while intellect/imagination increases innovative work behaviour (0.13). Remote work reduces the influence extraversion has on work engagement, while remote work five days a week also reduces the effect conscientiousness has on general health. Remote work did not moderate trait–performance linkages associated with intellect/imagination, agreeableness or neuroticism. This study provides updated knowledge on trait–performance linkages post-COVID-19 and demonstrates that remote work can reduce the positive influence of extraversion and conscientiousness.

Keywords: remote work; big five; personality traits; performance; work behaviour; occupational health outcomes; work engagement; innovative work behaviour; general health; sick leave

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1. Introduction

A consequence of the COVID-19 pandemic was an accelerated shift to remote work. The remote work trend was already underway, involving work migration to online and virtual environments. However, COVID-19 forced many into mandatory work from home, reducing the generalisability of prior findings (Kniffin et al. 2021). Remote work leads to many new challenges, such as having space in ones home to attend work, navigating space with others when not living alone, work–family conflict, virtual teamwork, and virtual leadership. There is also a diverse range of social–psychological impacts for individuals, such as social distancing, loneliness, and general influence on health and well-being. Successful adjustments to work changes, such as remote work, can be related to individual differences. According to a second-order quantitative review, extraversion and conscientiousness play important roles in successful adjustment (Wilmot et al. 2019). Kniffin et al. (2021) illustrate how extraversion and conscientiousness can play a role during remote work; the need for social distancing can, for instance, increase tendencies toward introversion. While conscientiousness is associated with workplace benefits, remote work can create unpredictability, increasing job complexity and decreasing the beneficial effects of conscientiousness (Kniffin et al. 2021; Wilmot and Ones 2019).

Leonardi et al. (2024) suggest some persons will benefit from remote work, while others need more social interaction visibility associated with an office environment. Previous research has investigated how personality traits influence remote work preferences (Patitsa et al. 2023), remote work effectiveness (O'Neill et al. 2014), remote work exhaustion (Parra et al. 2022). Additionally, studies have examined personality traits during COVID-19 and enforced remote work (Anglim and Horwood 2021). However, longitudinal research with heterogeneous samples (Blank et al. 2023) and diverse performance indicators across varying time periods is necessary (Evans et al. 2022) and is still missing. We also contend that further research is necessary during non-crisis periods, extending beyond the COVID-19 pandemic. Given the limited number of heterogeneous longitudinal studies examining how remote work moderates personality trait–performance linkages, we aim to contribute fresh empirical insights to the research field.

Based on the abovementioned research, we aimed to investigate the link between personality traits and work behaviours and whether remote work moderates these associations. We focused on two critical performance dimensions: work behaviour and occupational health outcomes. In the current study, work behaviour encompasses work engagement and innovative work behaviour, while health outcomes include general health assessment and sick leave. Increasing our knowledge of the effects of remote work on the link between personality and diverse work performance outcomes is essential to the increase in remote work in today's work life. In the current study, we utilised a heterogeneous panel sample of 801 employees employed in Norway, and the employees were approached twice over a year. Our research model is shown in Figure 1.

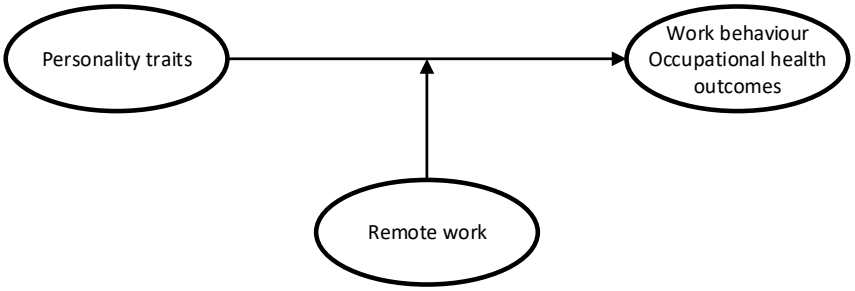

Figure 1. Research model of the current study.

2. Theoretical Background

During the 1980s, personality psychologists agreed that five robust personality factors could serve as a meaningful taxonomy for classifying personality attributes (Digman 1990). The "Big Five" personality traits are labelled (1) extraversion/introversion; (2) emotional stability, stability, emotionality, or neuroticism; (3) agreeableness; (4) conscientiousness; and (5) openness, intellect, or imagination. The five-factor model has significant implications for personnel psychology, as it demonstrates that personality comprises five relatively independent dimensions that offer a meaningful classification system for studying individual differences. In any scientific field, having such an organised classification system is crucial for the communication and accumulation of empirical findings (Barrick and Mount 1991).

During the last decades, an impressive body of literature has accumulated supporting the robustness of the five-factor model, even though some researchers still have reservations about the Big Five and advocate alternative models (Feher and Vernon 2021).

In 1991, Barrick and Mount (1991) published the first large and important meta-analysis investigating the relation of the Big Five with three job performance criteria: job proficiency, train proficiency, and personnel data. The study indicated conscientiousness had consistent relations across criteria and occupational groups, while correlations regarding the remaining personality dimensions varied by occupational group and criterion type. Barrick and Mount concluded that the Big Five were valid predictors for some occupations

and criterion types and that findings had numerous implications for research and practice (Barrick and Mount 1991).

In a more recent review, Judge and Zapata (2015) concluded that all five personality traits were stronger predictors of job performance in "weak situations", meaning where the work was unstructured and employees had the discretion to make decisions. Additionally, many traits predicted performance in job contexts where specific traits were activated. For instance, extraversion was a better predictor of performance in jobs requiring social skills, while agreeableness was less related to performance in competitive contexts. Openness was more strongly related to job performance with solid innovation/creativity requirements (Judge and Zapata 2015). Conclusively, situational factors can moderate the relationship between personality traits and performance outcomes.

Trait Activation Theory (TAT) posits that personality traits are expressed as valued work behaviour in response to trait-relevant situational cues, subject to constraints and other factors, all operating at the task, social, and organisational levels (Tett et al. 2021). TAT extends interactionist principles and targets situational specificity of trait–performance linkages. It suggests that personality traits are expressed as valued work behavior in response to trait-relevant situational cues, subject to constraints and other factors, all operating at the task, social, and organisational levels. Hence, to better understand and advance personality dynamics research, Tett et al. (2021) recommend research to conduct longitudinal studies on trait–situation processes. Guion and Gottier (1965) cautioned that a trait's value depends on the situation. Accordingly, the predictive validity of traits might increase or decrease based on situational contingencies. TAT posits that personality traits are latent potentials to behave, think or feel in identifiable ways in response to trait-relevant situational cues. A review of 99 sources citing TAT supported situational cues influences within-person variability and trait–performance linkages over time (Tett et al. 2021). Hence, studies should consider including situational moderators when investigating trait–performance linkages in longitudinal studies.

The next question relevant to today's work life is whether remote work functions as a situational moderator on trait–performance linkages. Remote work accelerated following the COVID-19 pandemic (Blank et al. 2023), but there is still relatively little knowledge on how remote work deteriorates or strengthens trait–performance linkages and if the moderation effects are solid or weak. Evans et al. (2022) delved into the associations between personality traits and shifts in five job-related aspects (self-reported performance, engagement, job satisfaction, burnout, and turnover intentions) amidst the transition to mandatory remote work. The research revealed significant variations in job outcomes among individuals. Despite extroversion and conscientiousness traditionally being linked with positive results, they were associated with diminishing outcomes over time. Extroverted and conscientious employees exhibited decreased productivity, engagement, and job satisfaction, while extroverted individuals reported higher levels of burnout. These insights deepen our comprehension of how personality traits forecast alterations in performance, well-being, and turnover intentions within individuals amid the pandemic.

A similar study (Anglim and Horwood 2021) investigated the effect of the COVID-19 pandemic on subjective well-being (SWB) and psychological well-being (PWB) and whether the pandemic period with high levels of isolation and remote work moderated the effect of personality on well-being. When comparing pre-COVID-19 and COVID-19 groups on well-being variables, there was a consistent pattern of the COVID-19 sample experiencing reduced well-being. Self-assessments also revealed increased stress, loneliness, boredom, fear, and lower optimism levels. Moreover, the average absolute correlation between personality and well-being was significantly higher in the pre-COVID-19 sample (mean $r = 0.35$) than in the COVID-19 sample (mean $r = 0.30$). The effect of extroversion on positive affect was reduced during COVID-19, and the impact of agreeableness on positive affect was also reduced during COVID-19 (Anglim and Horwood 2021).

Conclusively, the review conducted by Blank et al. (2023) indicates a need for more longitudinal studies on the health impact of remote work using heterogeneous and larger samples. Despite a few studies on trait–remote work–outcome relationships, we need more knowledge on how remote work influences trait–performance linkages across populations, using different types of performance indicators and time periods (Evans et al. 2022). Hence, the current study aims to study trait–performance linkages using two performance categories: work behaviour (work engagement and innovative work behaviour) and occupational health outcomes (general health and sick leave). We explore how remote work potentially moderates the trait–performance linkages. In the current study, we adopted the following names of the Big Five personality traits: extraversion, emotional stability, agreeableness, conscientiousness, and intellect/imagination (Donnellan et al. 2006).

2.1. Hypotheses: Personality Traits and Performance Outcomes

In the first extensive review studying trait–performance linkages, Barrick and Mount (1991) concluded that "conscientiousness is most likely to be a valid predictor for all jobs" (p. 21). Conscientiousness contributes to job success since this trait measures planful, organised, hardworking, persistent, and achievement-oriented behaviour contributing to the performance at work (Barrick and Mount 1991).

However, the other Big Five traits are also linked to occupational success and other life course variables (Soldz and Vaillant 1999). For instance, neuroticism reduces early adult adjustment and increases smoking; extraversion increases maximum income; openness increases creativity; and agreeableness increases social support. Over the life span, conscientiousness has the most significant influential effects, increasing early adult adjustment and decreasing psychiatric usage. Based on the life course study by Soldz and Vaillant (1999), we should expect the most significant associations with neuroticism, extraversion, and openness.

The Big Five traits have several relationships with the occupational health of workers. For instance, all Big Five traits, except neuroticism, are positively linked with resilience (Oshio et al. 2018) and lower levels of loneliness (Buecker et al. 2020). On the contrary, neuroticism decreases resilience (Oshio et al. 2018) and increases the risk of loneliness (Buecker et al. 2020). Anglim and colleagues (Anglim et al. 2020) concluded from their meta-analysis that openness, agreeableness, extraversion, and conscientiousness have positive relations with well-being, while neuroticism is negatively associated with well-being.

In the current study, lower levels of sick leave reflect presentism and better occupational health. Hence, based on the abovementioned literature, the following hypotheses were formulated:

Hypothesis 1. *Conscientiousness, extraversion, intellect/imagination, and agreeableness positively influence work behaviour and occupational health.*

Hypothesis 2. *Neuroticism negatively influences work behaviour and occupational health.*

2.2. Hypotheses: Moderating Role of Remote Work

The knowledge of how remote work influences personality trait–performance linkages is limited (Blank et al. 2023). However, Evans et al. (2022) explored the relationship between personality and within-person changes in five job outcomes (self-reported performance, engagement, job satisfaction, burnout, and turnover intentions) during the transition to enforced remote work. From May to August 2020, employees working from home due to COVID-19 reported performance to decrease on average throughout the study, whereas the other outcomes remained stable. The study found that there was significant variability in job outcomes between individuals. Extroversion and conscientiousness, two traits typically associated with positive outcomes, were linked to declining outcomes over time. Extroverted and conscientious employees became less productive, less engaged, and less satisfied with their jobs, and extroverted employees reported an increase in

burnout. These findings contribute to our understanding of how personality predicts changes in performance, well-being, and turnover intentions within individuals during high levels of remote work. Thus, in line with the research above, we posit that remote work reduces the positive effects of extroversion and conscientiousness on work behaviour and occupational health.

Hypothesis 3. *Remote work reduces the positive influence conscientiousness and extraversion have on work behaviour and occupational health.*

2.3. Open Research Questions

Another question is whether remote work is a job resource—e.g., increasing autonomy and work engagement—or a job demand, increasing workload, stress, and, for instance, sick leave. A recent review (Blank et al. 2023) concluded that "the current evidence base is not strong enough to determine whether certain individual factors are most important in the pathway between home working and health outcomes, and there is a further lack of evidence to determine which groups within a population might be at greatest risk of negative outcomes" (Blank et al. 2023, p. 77). Since there are few studies on how remote work potentially moderates the influence neuroticism, intellect/imagination, and agreeableness have on work behaviour and occupational health, the following research question was formulated:

Research Question 1. *Does remote work moderate the influence neuroticism, intellect/imagination, and agreeableness have on work behaviour and occupational health?*

3. Methods

3.1. Participants and Procedures

Data from this study were polled from an ongoing longitudinal work–life panel study in Norway. Specifically, data from the third and fourth waves was employed and labelled T1 (September 2022) and T2 (September 2023) in the current study.

Norstat Norway collected data through an electronic questionnaire. From Norstat's panel of active participants, there were substantial respondents in each wave, T1 (N = 1531) and T2 (N = 1517). The samples used in this study include the 801 respondents who completed the survey at both T1 and T2 (Table 1). The selection of these two waves was based on two methodological considerations: (1) the time lag was 12 months and (2) we improved the measurement of remote work reflecting behaviour instead of attitudes.

Survey participants were explicitly informed that their responses would be utilised solely for research purposes. They were also granted the right to withdraw their participation at any point. To ensure respondent anonymity, a two-step procedure was implemented. While Norstat retained identity information for potential follow-up studies, these data were not disclosed to the research team. After data collection, an anonymised data file was made available for analysis. Norstat adheres to Directive 95/46/EC of the General Data Protection Regulation and complies with Norwegian data protection laws and the research standards outlined by ICC/ESOMAR and the Quality Management System ISO9001:2015 (Abuhav 2017). The Norwegian Centre for Research Data (NSD) had no ethical concerns with this project.

Table 1. Demographics.

	n	%
Gender		
Female	365	45.6%
Male	436	54.4%
Age		
20–24	13	1.6%
25–39	267	33.3%
40–54	276	34.5%
55–66	203	25.3%
67–74	42	5.2%
Education		
Primary and lower secondary school	15	1.9%
Secondary school (incl. former vocational school)	100	12.5%
Vocational school and other 1–2 year programmes after upper secondary school	145	18.1%
University/college up to 3 years (bachelor's degree)	250	31.2%
University/college 4 years or more (master's degree and higher)	287	35.8%
Other	4	0.5%
Remote work		
0 day per week	523	65.9%
1 day per week	128	16.1%
2 days per week	81	10.2%
3 days per week	28	3.5%
4 days per week	13	1.6%
5 days per week	21	2.6%
Total	801	-

3.2. Measures

The Big Five factors of personality were measured using the adapted version of Mini-IPIP (Donnellan et al. 2006), including five subscales: extraversion (4 items—e.g., "*Am the life of the company*"), agreeableness (4 items—e.g., "*Sympathise with others' feelings*"), conscientiousness (4 items—e.g., "*Get things done right away*"), neuroticism (4 items—e.g., "*Have frequent mood swings*"), and intellect/imagination (4 items—e.g., "*Have a vivid imagination*"). Items were scored on a 5-point Likert-type scale ranging from 1 (very wrong) to 5 (very correct). In terms of internal consistency (α) at Time 1, extraversion was 0.82, agreeableness was 0.82, conscientiousness was 0.66, neuroticism was 0.75, and intellect/imagination was 0.77.

Work engagement was measured using the UWES-3 scale (Schaufeli et al. 2019) with three items. A sample item is "*I am immersed in my work*". Items were scored on a 5-point Likert-type scale ranging from 1 (completely disagree) to 5 (completely agree). The internal consistency (α) was 0.83 at Time 2.

Innovative work behaviour was measured using a 9-item scale, including three stages of innovation in the workplace: idea generation (3 items—e.g., "*Creating new ideas for improvements*"), idea promotion (3 items—e.g., "*Mobilising support for innovative ideas*"), and idea realisation (3 items—e.g., "*Evaluating the utility of innovate ideas*") (Van der Vegt and Janssen 2003). Items were scored on a 5-point Likert-type scale ranging from 1 (never) to 5 (always). In terms of internal consistency (α) at Time 2, idea generation was 0.83, idea promotion was 0.89, and idea realisation was 0.87.

General health was assessed with a single-item measure ("*How is your health in general?*"), an approach found not only easily manageable for survey respondents but also a valid and reliable method for measuring general health (DeSalvo et al. 2006; Macias et al. 2015). Items were scored on a 5-point Likert-type scale ranging from 1 (very bad) to 5 (very good).

Sick leave was measured with one item: "*How many days in total have you been away from work and on reported sick leave during the previous 12 months?*" (Aronsson and Lindh 2004). The responses were scored on a five-point response scale: 1 = (None); 2 = (fewer

than 6 days); 3 = (6–10 days); 4 = (11–23 days); 5 = (More than 24 days). The response scale was treated as a continuous variable in this study.

Remote work was constructed in the research project and measured with one item: "*How many days do you have a home office during a normal working week?*". The measure reflects remote work behaviour, not remote work attitude, which was the intention. The responses were scored on a five-point response scale: 0 = (none); 1 = (1 day per week); 2 = (2 days per week); 3 = (3 days per week); 4 = (4 days per week); 5 = (5 days per week). The response scale was treated as a continuous variable in this study.

Control variables in this study include age, gender, and education at Time 2.

3.3. Data Analysis

Structural equation modeling (SEM) using Mplus 8.3 (Muthén and Muthén 2017) was conducted. Descriptive statistics and confirmatory factor analysis (CFA) across different waves were examined in preliminary analysis. Parameters in this study were estimated using maximum likelihood estimation, and missing data were handled using full information maximum likelihood to decrease bias (Enders 2001). Finally, to examine the moderating role of remote work at Time 2 related to Big Five factors of personality at Time 1 and outcomes (i.e., behaviour and general health) at Time 2, a latent moderated structural equation (LMS) approach (Klein and Moosbrugger 2000) was conducted using the XWITH command in Mplus 8.3 software. Interaction effects were visualised and tested using established recommendations (Aiken et al. 1991; Cohen et al. 2013). Age, gender, and education at T2 were used as control variables to examine the robustness of the results.

4. Results

4.1. Preliminary Analysis

To evaluate the measurement structure of innovative work behaviour at T2, we conducted an χ^2 difference test and model fit indices (Kline 2015) to compare three measurement models: a single overall factor, three correlated factors, and a second-order (hierarchical) factor structure (with three first-order factors). Due to space constraints, detailed results are presented in Appendix A (Table A1). The results indicated that the second-order factor structure best represented the innovative work behaviour measurement structure, hence defending the use of an overall score on innovative work behaviour on our assessments.

Preliminary results also indicated it was necessary to delete two items associated with intellect/imagination and conscientiousness to improve the validity and reliability of these personality trait dimensions. Hence, the Mini-IPIP (Donnellan et al. 2006) was trimmed from 20 to 16 items. The measurement structure based on CFA results from the preliminary assessments is presented in Appendix B.

Descriptive statistics (i.e., study variable means, standard deviations, and bivariate correlations), AVE, and CR are described in Table 2. In line with recommended practices for CFA (Kline 2015; Muthén and Muthén 2017), we employed modification indices in Mplus to guide potential model refinements in the big five factors of personality in this study. Factor loadings on all items are described in Table A2. All factor loadings were significant in the CFA model, with standardised loadings above 0.50. Composite reliability and Cronbach's alphas ranged from 0.66 to 0.94, and the average variance extracted (AVE) ranged from 0.44 to 0.85. As suggested by Fornell and Larcker (1981), the convergent validity of the constructs is acceptable when composite reliability is greater than 0.6, even when the average variance extracted is less than 0.5. Olsen et al. (2024) also demonstrate that the predictive validity of dimensions with AVE scores below 0.5 can be higher than factors with AVE scores above 0.5. The fit indices of the hypothesised factor model (χ^2 = 875.18, df = 326, χ^2/df = 2.69, CFI = 0.95, TLI = 0.94, RMSEA = 0.05, SRMR = 0.04) was acceptable. Thus, the preliminary analysis indicated that the validity and reliability of the measurement model were satisfactory.

Table 2. Descriptive statistics, correlations, and AVE.

	Mean	SD	AVE	CR	1	2	3	4	5	6	7	8	9	10
1. Agreeableness T1	3.83	0.79	0.54	0.83	**0.74**									
2. Extraversion T1	3.15	0.91	0.54	0.82	0.36 *	**0.73**								
3. Conscientiousness T1	3.92	0.89	0.56	0.68	0.12 *	0.11 *	**0.75**							
4. Neuroticism T1	2.6	0.82	0.44	0.76	0.07 *	−0.10 *	−0.32 *	**0.67**						
5. Intellect/imaginationT1	3.4	0.93	0.62	0.77	0.27 *	0.20 *	0.11 *	−0.12 *	**0.79**					
6. Work engagement T2	3.33	0.93	0.63	0.84	0.16 *	0.27 *	0.14 *	−0.22 *	0.13 *	**0.8**				
7. Innovative work behaviour T2	3.18	0.75	0.85	0.94	0.18 *	0.28 *	0.05	−0.12 *	0.22 *	0.47 *	**0.92**			
8. General health T2	3.72	0.87	-	-	−0.02	0.13 *	0.18 *	−0.26 *	0.01	0.21 *	0.13 *	-		
9. Sick leave T2	2.2	1.31	-	-	0.14 *	0.01	−0.07 *	0.28 *	−0.01	−0.17 *	−0.06	−0.34 *	-	
10. Remote work T2	0.67	1.17	-	-	−0.12 *	0.01	−0.02	−0.10 *	0.05	0.06	0.05	0.03	0.01	-

Notes: Diagonal bold values are the square root of AVE. * Correlations are significant at the 0.05 level (2-tailed).

4.2. Personality Traits–Performance Linkages

Structural model testing indicated an acceptable fit ($\chi 2 = 1296.61$, df = 479, $\chi 2/df = 2.71$, CFI = 0.93, TLI = 0.92, RMSEA = 0.05, SRMR = 0.05. Several significant relations emerged when investigating the associations between personality traits, work behaviour and occupational health (see Table 3). Specifically, extraversion had a positive effect on work engagement (β = 0.25, $p < 0.001$, C.I. = [0.18, 0.39]) and innovative work behaviour (β = 0.26, $p < 0.001$, C.I. = [0.13, 0.28]), and was also a predictor of general health (β = 0.16, $p < 0.001$, C.I. = [0.08, 0.27]). Moreover, agreeableness was positively related to sick leave (β = 0.11, $p = 0.03$, C.I. = [0.02, 0.35]), and conscientiousness was positively associated with work engagement (β = 0.11, $p = 0.03$, C.I. = [0.01, 0.22]) and general health (β = 0.11, $p = 0.03$, C.I. = [0.01, 0.21]). Finally, intellect/imagination significantly predicted innovative work behaviour (β = 0.13, $p = 0.01$, C.I. = [0.03, 0.18]) and general health (β = −0.09, $p = 0.04$, C.I. = [−0.19, −0.01]). Hence, with the exception of the positive impact of agreeableness on sick leave, the significant results supported Hypothesis 1.

Table 3. The relationship between Big Five at Time 1 and related outcomes at Time 2.

	Outcome (Time 2)							
Predictor	**Behaviour**				**Worker Health**			
(Time 1)	**Work Engagement**		**Innovative Work Behaviour**		**General Health**		**Sick Leave**	
	B	**β**	**B**	**β**	**B**	**β**	**B**	**β**
Agreeableness	0.10	0.09	0.08	0.09	−0.07	−0.06	0.19 *	0.11
Extraversion	0.28 ***	0.25	0.21 ***	0.26	0.17 ***	0.16	−0.04	−0.02
Conscientiousness	0.11 *	0.11	0.01	0.01	0.11 *	0.11	−0.04	−0.02
Neuroticism	−0.18 **	−0.16	−0.06	−0.07	−0.23 ***	−0.21	0.38 ***	0.23
Intellect/imagination	<0.01	<0.01	0.10 **	0.13	−0.10 *	−0.09	0.06	0.04
Control variables								
Age	0.01	0.05	−0.01 **	−0.10	−0.01	−0.03	−0.01	−0.01
Gender	−0.10	−0.05	−0.13 **	−0.10	−0.07	−0.04	0.38 ***	0.15
Education	0.05	0.07	0.05 *	0.08	0.12 ***	0.15	−0.10 *	−0.08

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Gender: 1 = male, 2 = female. Control variables are measured at T2.

Conversely, neuroticism was consistently associated with negative outcomes, including a decrease in work engagement (β = −0.16, $p = 0.01$, C.I. = [−0.30, −0.06]), general health (β = −0.21, $p < 0.001$, C.I. = [−0.34, −0.12]), and an increase in sick leave (β = 0.23, $p < 0.001$, C.I. = [0.22, 0.55]). Hence, the significant impacts of neuroticism supported Hypothesis 2.

Significant associations were also revealed between the control variables age, gender, education, and work outcomes (see lower part in Table 3). Age showed a negative association with innovative work behaviour (β = −0.10, $p = 0.01$, C.I. = [−0.01, −0.01]), indicating a potential decline in innovative behaviour with increasing age. The gender effect indicates

that, compared to males, females are less likely to engage in innovative work behaviour (β = −0.10, p = 0.01, C.I. = [−0.22, −0.03]) and more likely to take sick leave (β = 0.15, p < 0.001, C.I. = [0.19, 0.57]). Education was positively related to innovative work behaviour (β = 0.08, p = 0.03, C.I. = [0.01, 0.09]) and general health (β = 0.15, p < 0.001, C.I. = [0.06, 0.17]), but was negatively related to sick leave (β = −0.08, p = 0.02, C.I. = [−0.18, −0.02]).

4.3. Remote Work as a Moderator on the Association between Personality Traits and Work Outcomes

When including remote work as a moderator, results revealed that the relationship between extraversion and work engagement was contingent upon the extent of remote work (Figure 2). Interestingly, as the prevalence of remote work increased, the positive effect of extraversion at Time 1 on work engagement at Time 2 was attenuated (B = −0.11, p = 0.02, C.I. = [−0.20, −0.02]). This trend suggests that the typically outgoing and energetic nature of extroverted individuals may not be as effectively expressed or rewarded in remote work environments.

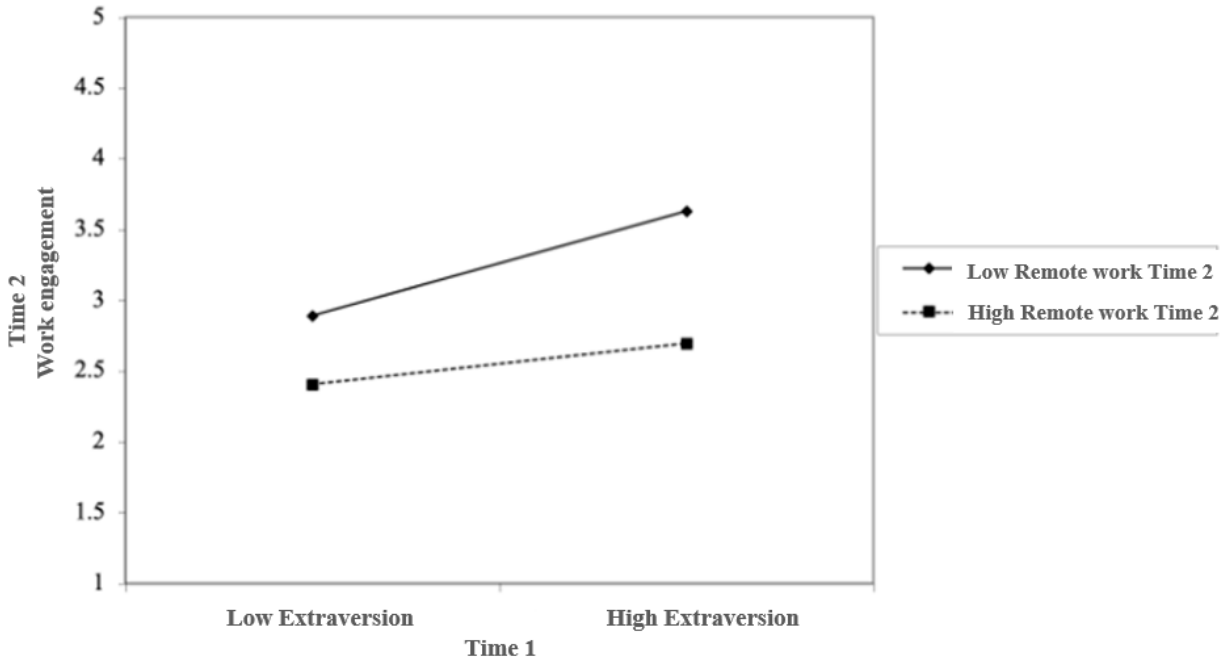

Figure 2. Remote work (Time 2) moderates the relationship between extraversion (Time 1) and work engagement (Time 2).

When comparing high remote work (5 days per week) with low remote work (0 days per week), the difference in outcomes increases even more (Figure 3). For individuals with high extraversion, working remotely five days a week, we found a substantial decrease in work engagement (B = −0.94, p = 0.03, C.I. = [−1.70, −0.18]) compared to those not working remotely. Similarly, remote work was found to moderate the effect of conscientiousness on general health. Specifically, the results showed that when individuals worked remotely five days a week, the relation between conscientiousness and general health was negative (B = −0.52, p = 0.02, C.I. = [−0.96, −0.08]). These categorical comparisons, visualised in Figure 3, underscore the complexity of remote work's impact, highlighting the potential for fully remote work arrangements to dampen the positive effects of extraversion and conscientiousness.

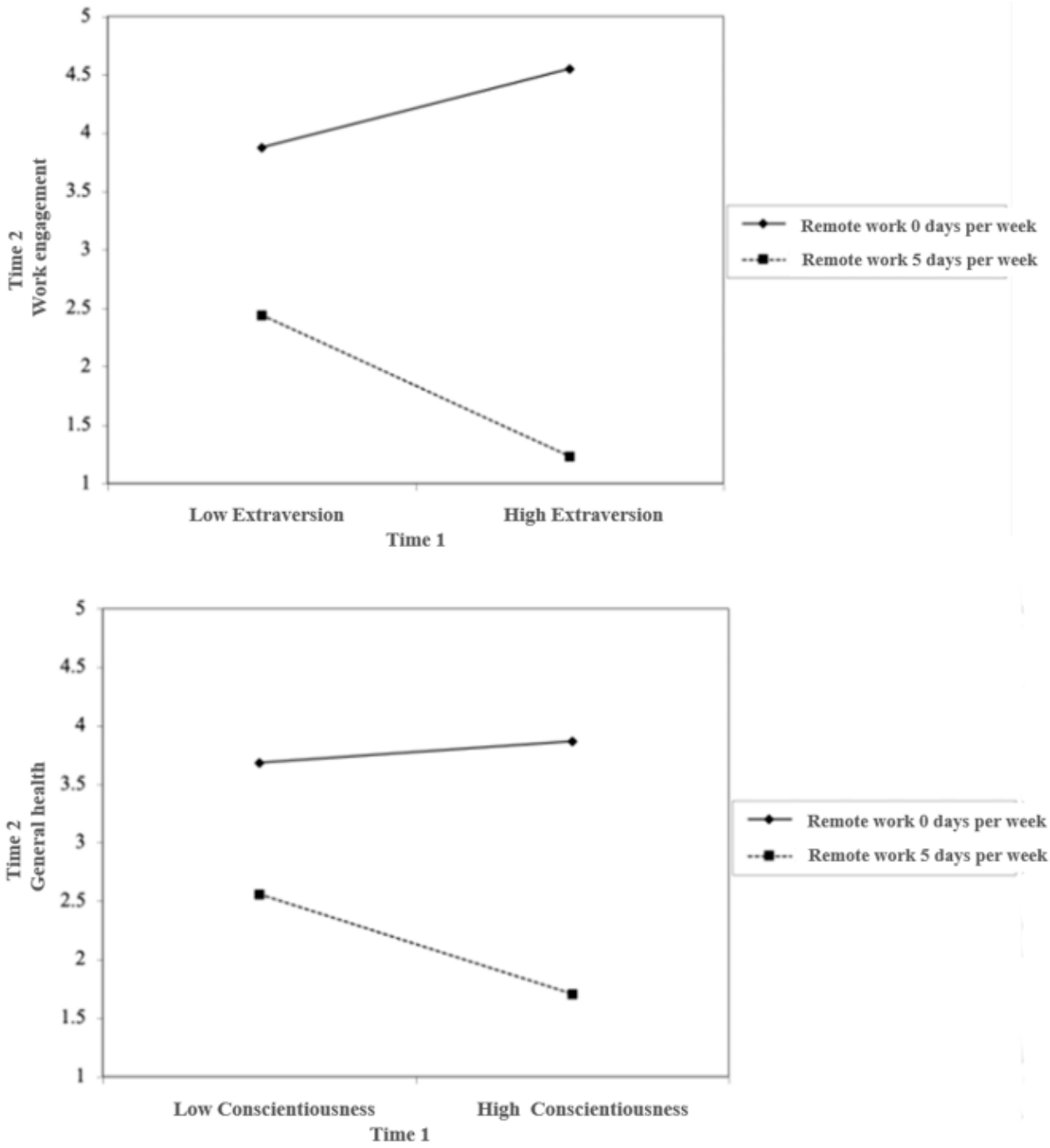

Figure 3. The moderating effects of remote work (0 vs. 5 days per week) on the relationships between extraversion (Time 1) and work engagement (Time 2) (above) and conscientiousness (Time 1) and general health (Time 2) (below).

5. Discussion

The current study explored associations between personality traits and work outcomes using a heterogeneous work sample. Beyond this, we explored how remote work moderates these relations. To our knowledge, this is the first longitudinal study investigating how remote work moderates the link between personality and work outcomes in the post-COVID-19 period.

5.1. Personality Traits and Performance Outcomes

In the current study, we expected conscientiousness, extraversion, intellect/imagination, and agreeableness to positively influence work behaviour and occupational health (Hypothesis 1). In contrast, neuroticism was expected to have a negative effect (Hypothesis 1).

The results showed that extraversion was strongly associated with work engagement, innovative work behaviour, and general health but was unrelated to sick leave. Conversely, neuroticism was negatively associated with work engagement and general health and positively related to sick leave. Agreeableness had a positive effect on sick leave. Still, agreeableness was not associated with work engagement, innovative work behaviour, or general health. In contrast, conscientiousness was positively associated with work engagement and general health but did not influence innovative work behaviour or sick leave. Lastly, intellect/imagination was positively related to innovative work behaviour and general health but unrelated to work engagement and sick leave.

The link between personality traits and work outcomes revealed several patterns; neuroticism and agreeableness had the most negative influence on worker health, whereas neuroticism had the most considerable effect. Hence, the results from this study align with previous research where neuroticism was found to have a negative impact on health (Anglim and Horwood 2021; Buecker et al. 2020; Oshio et al. 2018). However, it is worth mentioning that Raynik et al. (2020) did not find a relationship between agreeableness and sick leave, which contradicts the findings in the current study.

Extraversion had the most positive influence on general health but did not reduce the risk of sick leave. Previous studies found that extraversion reduced future risk of disability pensioning (Østby et al. 2018) but did not predict future sick leave at conventional significance levels (Raynik et al. 2020).

Generally, our findings indicate some consistent patterns, due to the negative effects of neuroticism on general health, combined with positive impact on sick leave. Hence, the results demonstrate neuroticism has the most substantial relationship with adverse health outcomes among Norwegian workers. The negative influence of agreeableness is somewhat more surprising. One interpretation of these results is that more agreeableness can lead to higher workload and stress, e.g., if workers are willing to take on more work tasks, this can increase workload because of this trait. Since we did not include workload in the current study, more research is needed to explore why agreeableness potentially negatively affects worker health.

Extraversion positively affected both work engagement and innovative work behaviour, reflecting the importance of extraversion for these performance indicators. We could perhaps expect conscientiousness to be equally important, but conscientiousness only had an effect on work engagement, which was lower than the impact from extraversion. Intellect/imagination only had a positive impact on innovative work behaviour while not on work engagement. In contrast, neuroticism negatively affected work engagement but did not impact innovative work behaviour.

These results reflect interesting patterns between personality trait–performance linkages and support the predictive validity of the short personality trait instrument, Mini-IPIP (Donnellan et al. 2006), used in the current study. However, it should be noted that four items were removed during the validation process to improve the model fit of the Mini-IPIP. Neurotisism kept all four items in the revision process, but the AVE score on neuroticism (0.44) was somewhat below the 0.5 threshold. Still, neuroticism was significantly related to three out of four criteria, reconfirming that the AVE criterion is too strict when assessing validity (Olsen et al. 2024). Another note on measurement is that the second-order model had the best model fit when measuring innovative work behaviour.

5.2. Moderating Role of Remote Work

We expected remote work to reduce the positive influence conscientiousness and extraversion have on work behaviour and occupational health (Hypothesis 3), which was partially supported.

Remote work reduces the effect extraversion has on work engagement. Moreover, working remotely five days a week has detrimental effects, reducing extraversion's positive effect on work engagement and consciousness's positive impact on general health. To our knowledge, this is the first study investigating how remote work can affect trait–performance linkages. Previously, remote work's influence on the trait–performance linkage was only studied in connection with enforced work during COVID-19 (Evans et al. 2022). Interestingly, remote work does not moderate the trait–performance linkages of agreeableness, neuroticism and intellect/imagination. Hence, the study findings suggest that remote work only triggers unwanted moderation effects concerning extraversion and conscientiousness. Specifically, this study demonstrates that remote work can potentially reduce how extraversion translates towards improving work engagements and how consciousness can improve workers' general health.

The current study does not explain why remote work reduces the positive effect of extraversion and conscientiousness. However, previous research aligns with the findings of the current study. Evans et al. (2022) found that extroverted and conscientious employees became less productive, less engaged, and less satisfied with their jobs during enforced remote work. Moreover, during enforced remote work, extroverted employees reported increasing burnout. On the contrary, another study by Oksa et al. (2023) demonstrated that remote work had more or less no relationship with well-being profiles. However, this study measured remote work with a no or yes option, which does not indicate or specify the level of remote working, limiting the impact of the research. Additionally, dichotomous variables have lower variance and correspondingly weaken the estimated size of the relations between variables (DeCoster et al. 2009). We consider it a study strength that all measures are measured on five-point scales, aligning the measures and informing about the level of remote work reflected in the number of days.

Common sense would suggest that it is hard to be social and extraverted if you work at home for more than half of the work week, and it, therefore, makes sense that this work situation over time can reduce work engagement among extroverted workers. Simultaneously, working remotely five days a week can make it challenging to plan and work systemically with colleagues, leading to stress and potentially being detrimental to workers scoring high on conscientiousness.

Lastly, it is worth mentioning that remote work does not moderate the influence neuroticism, intellect/imagination, and agreeableness have on work behaviour and occupational health (research question 1). Hence, the current study indicates these traits are not sensitive or triggered much by remote work settings.

Lastly, the time frame of the current study was one year. The results support that this time interval aligned adequately with our research model. Hence, other time frames could have produced different results, and therefore, other time frames should be carefully considered in future studies.

6. Implications

6.1. Theoretical Implications

The current study adds new theoretical knowledge by demonstrating that remote work can moderate and reduce the beneficial effects extraversion and conscientiousness have on performance. Based on the results and TAT, we can argue that remote work is a somewhat "strong" situation since remote work settings can alter the influence of extraversion and conscientiousness. On the other hand, others might argue that remote work is not that strong since remote work does not moderate the influence of agreeableness, intellect/imagination, or neuroticism.

In summary, our research suggests that remote work can have varying effects on individuals based on their personal preferences and needs. Extraverted individuals who thrive on social interaction and visibility probably have a tendency to prefer office environments (Leonardi et al. 2024; Leonardi and Treem 2020). Our study highlights the need to develop a better theoretical understanding of the fit between remote office policies, personality

traits, and, finally, performance outcomes. Perhaps in the future, employers will adapt their workplace so that individuals with different personality trait profiles, compared to having one HR strategy targeting all staff as a group. To some degree, this study supports the need to particularly develop social settings and connect people high on extraversion to keep these individuals engaged, innovative, and healthy. Integrating job crafting (Bakker et al. 2012) as part of HR strategies might also be advantageous in encouraging people to craft their jobs and increasing the fit between individuals' personality traits and job situations. People high in extraversion could, for instance, develop larger social networks and attend more physical meetings. The topics mentioned above illustrate the need to develop a better theoretical understanding of linkages between person–environment fit, remote work, and HR policies.

6.2. Practical Implications

This study provides updated insights into trait–performance linkages post-COVID-19. It highlights the importance of considering personality traits when designing interventions and support systems for remote workers. Additionally, organisations should recognise that remote work may alter the impact of certain traits, such as extraversion and conscientiousness.

Concerning remote work, the primary risk group is people high in extroversion, and the secondary risk group is individuals high in conscientiousness. For individuals high in these traits, it does not help that three of the other personality factors are not moderated by remote work. Organisations should consider these findings when developing remote work policies and long-term HR strategies, such as limiting remote work levels.

Moreover, this study indicates extraversion and conscientiousness positively impact wanted outcomes, increasing work engagement and improving worker health, while neuroticism has the opposite effect. Extraversion and intellect/imagination are most important for innovative work behaviour. People higher on agreeableness have a higher risk of sick leave, indicating individuals high in this trait must practice the skill to stand up for themself. All results can also guide staff recruitment since all traits are associated with performance. Specifically, assessing personality traits can be beneficial during the recruitment process. Personality profiles can probably also be valuable in combination with coaching since trait profiles can be helpful when giving advice on coping and development at work.

Currently, many companies are experimenting with new office policies that are increasing the use of remote work. However, this approach carries risks, particularly for sub-groups of individuals who score higher on extraversion and conscientiousness. If there is little flexibility and autonomy in these office arrangements, these individuals might suffer negative consequences. Additionally, it may not be functional for individuals to work from the office location to connect when and if all other colleagues are working from home. Hence, remote work policies can significantly impact an organisation's working environment and culture in the short and long run. Therefore, we still need to develop theoretical frameworks addressing questions such as (a) who will work remotely, (b) where will people work remotely, (c) when will people work remotely, (d) why people will work remotely, and (e) how people will work remotely (Leonardi et al. 2024, p. 193). These considerations are crucial for shaping effective remote work strategies and ensuring a positive organisational experience.

7. Limitations

This study has certain limitations that need to be mentioned. In the current study, we did not measure or control the quality of remote work settings, such as distractive work environments, which can reduce work engagement in remote work settings (Galanti et al. 2021). Another limitation of our research is that all measures are measured using self-reports, not combining multisource data. However, to compensate for this limitation, we first tested and demonstrated that all psychometric qualities of the measures were

adequate. Moreover, we did not use narrower Big Five facets, which some recommend (Hurtz and Donovan 2000).

This study provides updated information on trait–performance linkages. It reveals that a high level of remote work can reduce the positive and wanted effects of extraversion and conscientiousness on worker outcomes. However, it is noteworthy that the majority of the sample does not work remotely; most workers (65.9%) in our Norwegian sample never work remotely, 16.1% work remotely one day per week, 10.2% work remotely two days per week, 7.7% work remotely three or more days per week, and 2.6 work remotely five days per week. Hence, the variance in the remote variable is not normally or perfectly distributed. Therefore, replicating the current study in a more balanced sample including a higher share of remote workers and a more ideal distribution of remote work levels could be relevant.

8. Concluding Remarks

Compared to the classic meta-analysis conducted by Barrick and Mount, the current study confirms "the benefits of using the 5-factor model of personality to accumulate and communicate empirical findings" (Barrick and Mount 1991, p. 1). Study findings demonstrate the diverse influence the Big Five has on four different performance outcomes across work settings among Norwegian workers. Big Five associations varied relatively much by performance category, confirming previous research (Zell and Lesick 2022).

Findings reflect future studies should consider integrating remote work when investigating personality trait–performance linkages in work–life settings.

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Institutional Review Board Statement: Survey participants were explicitly informed that their responses would be utilised solely for research purposes. They were also granted the right to withdraw their participation at any point. To ensure respondent anonymity, a two-step procedure was implemented. While Norstat retained identity information for potential follow-up studies, this data was not disclosed to the research team. After data collection, an anonymised data file was made available for analysis. Norstat adheres to Directive 95/46/EC of the General Data Protection Regulation and complies with Norwegian data protection laws and the research standards outlined by ICC/ESOMAR and the Quality Management System ISO9001:2015. The Norwegian Centre for Research Data (NSD) had no ethical concerns with the project

Informed Consent Statement: Informed consent was obtained from all subjects involved in this study.

Data Availability Statement: Data are unavailable due to privacy.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Fit statistics for innovative work behaviour.

	χ^2	df	CFI	TLI	RMSEA	SRMR
M1. One overall factor	358.104	27	0.934	0.912	0.124	0.044
M2. Three correlated factors	54.849	24	0.994	0.991	0.040	0.016
M3. Second-order factor	54.849	24	0.994	0.991	0.040	0.016
	$\Delta\chi^2$	Δdf	*p*-value			
M1 vs. M2/M3	303.255	3	<0.001			

Appendix B

Table A2. Factor loadings of latent variables (CFA).

	Item	β
Agreeableness T1	2. Sympathise with others' feelings.	0.687
	7. Am not interested in other people's problems. (R)	0.802
	12. Feel others' emotions.	0.739
	17. Am not really interested in others. (R)	0.717
Extraversion T1	1. Am the life of the party.	0.703
	6. Don't talk a lot. (R)	0.763
	11. Talk to a lot of different people at parties.	0.665
	16. Keep in the background. (R)	0.794
Conscientiousness T1	8. Often forget to put things back in their proper place. (R)	0.551
	18. Make a mess of things. (R)	0.905
Neuroticism T1	4. Have frequent mood swings.	0.784
	9. Am relaxed most of the time. (R)	0.580
	14. Get upset easily.	0.732
	19. Seldom feel blue. (R)	0.534
Intellect/imagination T1	10. Am not interested in abstract ideas. (R)	0.784
	15. Have difficulty understanding abstract ideas. (R)	0.793
Idea generation_IWB T2	1. Creating new ideas for improvements.	0.831
	2. Searching out new working methods, techniques, or instruments.	0.824
	3. Generating original solutions to problems.	0.721
Idea promotion_IWB T2	4. Mobilising support for innovative ideas.	0.849
	5. Acquiring approval for innovative ideas.	0.871
	6. Making important organisational members enthusiastic for innovative ideas.	0.844
Idea realisation_IWB T2	7. Transforming innovative ideas into useful applications.	0.872
	8. Introducing innovative ideas into the work environment in a systematic way.	0.816
	9. Evaluating the utility of innovate ideas.	0.799
Work engagement T2	1. At my work, I feel bursting with energy.	0.794
	2. I am enthusiastic about my job.	0.898
	3. I am immersed in my work.	0.683

Note: IWB = innovative work behavior. (R) = reverse scored item.

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