

Work Interruptions in the Context of Digitalised Communication – The Influence of Age and Technology Affinity

Vera B. RICK¹, Christopher BRANDL^{1,2}, Alexander MERTENS¹, Verena NITSCH^{1,2}

*¹ Institute of Industrial Engineering and Ergonomics,
RWTH Aachen University,*

Elfschornsteinstr. 18, D-52062 Aachen

*² Fraunhofer Institute for Communication,
Information Processing and Ergonomics FKIE, Fraunhofer FKIE,
Campus Boulevard 55-57, D-52074 Aachen*

Abstract: Work interruptions are considered one of the most common work stressors, which is why understanding interruptions is crucial for the long-term health of employees. For this purpose, a survey was conducted to record work interruptions among N = 492 full-time employees in Germany. The results show that work interruptions are significantly negatively related to the general well-being of employees, with this relationship being moderated by the age and technology affinity of the participants. In the light of demographic change, the technology-driven spread of new forms of work organisation and the rise in health-related absences due to psychological risks, it becomes particularly important to raise awareness of the potential effects of work interruptions at the workplace.

Keywords: work interruptions, office work, digital workplace, well-being, age, technology affinity

1. Introduction

Increasing digitalisation and the technology-driven emergence of new forms of work have led to profound changes in the world of work. In addition, desk work in particular has experienced a change due to the Covid-19 pandemic, leading to an increased use of digital technologies for large parts of the office workforce. Looking at the impact of these changes, it is noticeable that mental stress is gaining in importance. The increasing number of personnel absences and early retirements due to mental illness are the result (Stansfeld & Candy, 2006).

When examining mental work stressors, work interruptions are considered to be one of the most common stressors (Baethge et al. 2015; BAuA 2020). On average, information workers spend more than two hours per day dealing with work interruptions (Marulanda Carter & Jackson 2012). Following the definition of Iqbal and Horvitz (2007), work interruptions can be defined as a temporary interruption of goal-directed actions and, based on the action regulation theory, interruptions disrupt the sequential action regulation process and can thus be regarded as a regulation obstacle (Hacker 2003). Increasing frequency of work interruptions has been found to lead to higher emotional exhaustion, higher subjective stress and lower overall well-being (Puranik et al. 2020; Rigotti 2016). When examining the effects of work interruptions in the context of digitalised communication, it can be assumed that the effects may be greater

for older workers than for younger employees. First, techno stress develops more in older people than in younger people, which makes interruptions by technical devices perceived as more disruptive (Tams 2017). Furthermore, cognitive and biological changes occur with age, leading to a reduced ability to ignore interruptions and focus on one main activity (Greengard 2009; Tams et al. 2021). Therefore, older employees may be at a disadvantage when it comes to using technological devices for work and processing the interruptions mediated by these devices in a healthy way. However, there is also evidence to suggest that the relationship between age and the effects of technology-related interruptions may be more complex than previously thought. For example, Tams et al. (2021) were able to demonstrate that older persons were more susceptible to the effects of technologically mediated interruptions, although the experience with technological devices helped to mitigate the relationship. In contrast, according to Baethge et al. (2015) a higher age is associated with better mechanisms for coping with job demands, as skills in dealing with demands presumably become more routine and release cognitive resources in the process of regulating action. Baethge et al. (2015) underlined, that specifically young and less experienced nurses suffered significantly more from work interruptions, whereas older nurses were able to deal with work interruptions more efficiently.

The aim of this study is therefore to examine the relationship between the frequency of work interruptions and the general well-being of employees, and to take a closer look at the moderating influence of the age of employees on the one hand and the moderating influence of the employees' affinity for technology on the other.

2. Method

The present study was conducted in the form of a one-day diary study in January 2022. Data were collected via an online survey, and participants were contacted through a survey panel provider who accessed a random sample of panel members who met survey inclusion criteria. The inclusion criteria required that respondents were at least 18 years old, not older than 67 years, hold a digital office workplace, and were employed full-time.

2.1 Measures

For the following analysis, the baseline survey, collected before the start of the diary study, was used. Participants were asked to rate their general well-being using the burnout scale of the German version of the *COPSOQ* questionnaire (Lincke et al. 2021) (answer options: "strongly disagree" (1) to "strongly agree" (5)). In addition, interruption frequency was measured using the corresponding item of the *ISTA* questionnaire (Semmer et al. 1999) (answer options: "never" (1), "seldom" (2), "occasionally" (3), "frequent" (4), very frequent (5)). To rate technology affinity, the corresponding item of the *SUMI* questionnaire was used (Kirakowski et al. 1993) (answer options: "I find most software difficult to use" (1), "I can cope with most software" (2), "I'm experienced but not technical" (3), "I'm very experienced and technical" (4)).

2.1 Sample

The sample consisted of 492 full-time office employees working in Germany. The sample included 45.5% female participants and 53.9% male employees, which is representative of the German working population. The age of participants ranged from 21 to 67 years, with an average age of 43.9 years ($SD = 11.9$). Technology affinity was rated very high ($M = 3.5$, $SD = 0.7$), employee well-being with $M = 2.58$ ($SD = 0.9$) and frequency of interruptions with $M = 3.9$ ($SD = 0.8$) are in the mid-range.

3. Analysis

First, a multi-stage screening of the responses received was carried out to ensure sufficient data quality. Participants with implausible completion times were excluded, using the relative speed index with a lenient cut-off of 2.0 as criterion (Leiner 2019). In addition, one attention check item was included, which participants had to pass (Shamon & Berning 2019).

A moderation analysis was conducted to determine whether the interaction between employee age and interruption frequency, employee technology affinity and interruption frequency, and the interaction between age, technology affinity and interruption frequency predicted well-being (Figure 1). The analysis was performed using the SPSS PROCESS macro by Hayes (2022) (version 4.1, model 3), which uses ordinary least squares regression, yielding unstandardized coefficients for all effects. Bootstrapping with 5000 samples together with heteroscedasticity consistent standard errors (Davidson et al. 1993) were employed to compute the confidence intervals. All variables that defined products were mean-centred. Both moderators involved metric scales, which is why effect sizes were compared when moderators were one standard deviation below their mean, at their mean and one standard deviation above their mean to test for the presence of moderated effects, a common approach for metric moderators and following the approach of Hayes (2022).

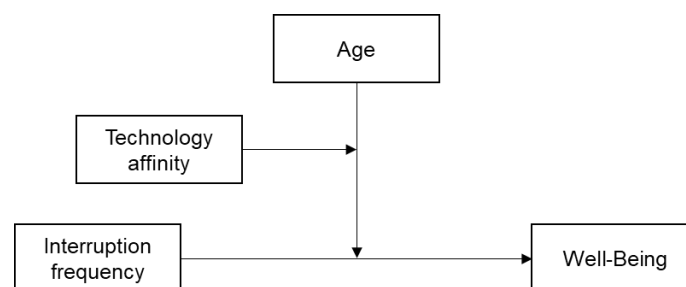


Figure 1: *Analysed moderation model*

3.1. Descriptive statistics, reliability and correlation analyses

Cronbach's alpha was calculated to assess the internal consistency of the burnout scale used to measure general well-being. The internal consistency is satisfying, with Cronbach's $\alpha = .88$. The correlation analysis reveals that the age of the participants correlates significantly negatively with technology affinity and general well-being.

Furthermore, interruption frequency is significantly positively correlated with employees' general well-being (Table 1).

Table 1: Pearson correlation coefficients

	Pearson correlation coefficient		
	2	3	4
Age (1)	-.10*	-.05	-.18**
Technology affinity (2)	1	-.06	-.08
Interruption frequency (3)		1	.26**
Well-being (4)			1

3.2. Moderating influence of employees' age and technology affinity

A moderation analysis was conducted to determine whether the interaction between employee age, employee technology affinity and interruption frequency predicts well-being. The overall model is significant, $F(7, 484) = 10.60$, $p < .001$, explaining 12.6 % of the variance. Moderation analysis shows that the three-way interaction of interruption frequency, age and technology affinity moderated the effect between interruption frequency and well-being significantly, $\Delta R^2 = 1.3\%$, $F(1, 484) = 4.85$, $p = .03$, 95%-CI [.002, .029]. Neither age nor technology affinity acts as a moderating variable on its own. The following Figure 2 illustrates the differences in well-being between young and older employees for low and high interruption frequency and low and high technology affinity, whereby this refers to the moderators that are shown on the one hand at a standard deviation below the mean value (-1 SD) and at a standard deviation above the mean value (+1 SD).

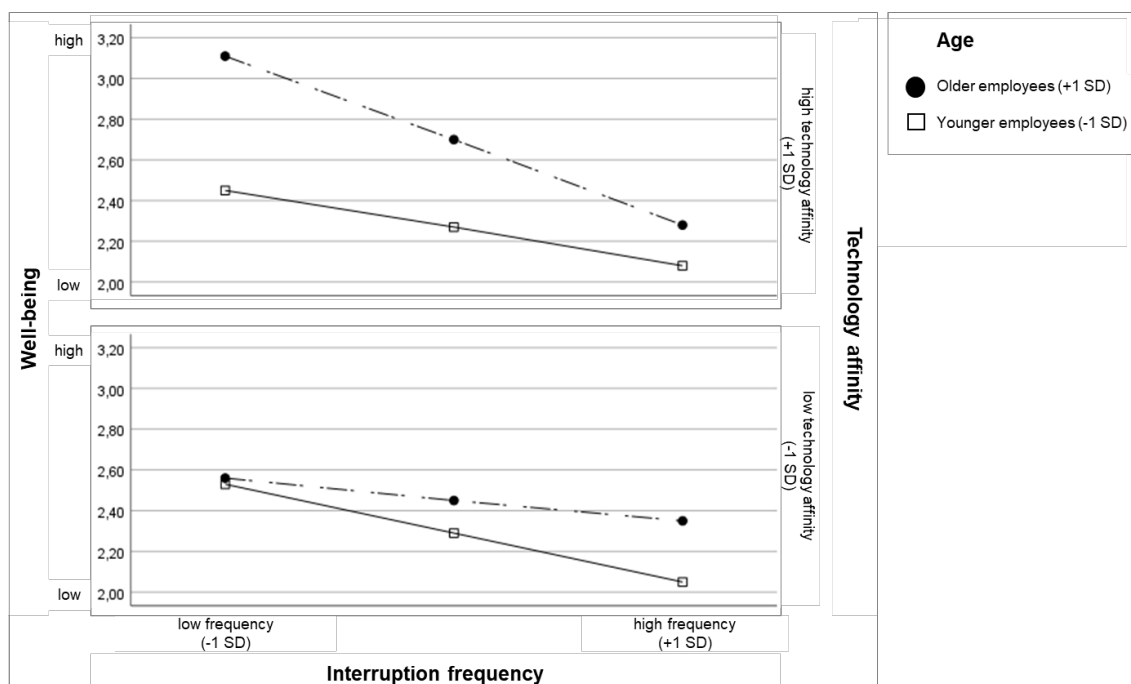


Figure 2: Moderation analyses with employees' age and technology affinity as moderators

It becomes apparent that, in principle, a higher frequency of work interruptions is associated with a lower well-being. If the moderators are considered, it can be seen that the effects of the interruption frequency on well-being is significantly more negative for older and less technologically affine employees than for the highly technologically affine employees. This effect is evident at a low interruption frequency, but decreases with increasing interruption frequency.

4. Discussion

As the global workforce ages and digital technologies and their associated work interruptions increase, it is important to examine how interruptions affect employees and, more specifically, how they affect older employees. Research results to date are, on the one hand, scarce and, on the other hand, inconsistent in terms of results. The results of this study first confirm the findings that work interruptions have a stronger impact on older employees compared to younger employees, in line with Tams (2017). Furthermore, it can be confirmed that the technology affinity of older employees can mitigate the negative effects of work interruptions, again in line with findings of Tams et al. (2021). In addition, the results can be specified in the sense that these effects apply in particular to employees with a lower interruption frequency. It can therefore be assumed that there are other influencing factors. Here, experience in dealing with work interruptions could be an explanation, if one assumes that people who often have to deal with work interruptions in their daily work routine have learned strategies and rules for dealing with them, so that the negative effects are less pronounced. This is in line with Baethge et al. (2015), who postulated that mechanisms for coping with work demands can be learned, so that dealing with demands presumably becomes more routine and cognitive resources can be released in the process of regulating action.

The study conducted has some limitations that need to be taken into account when interpreting the results obtained. Firstly, the study only examined the perspective of one country and one occupational setting. The sample included only German participants and the focus was on digital office workplaces, thus it is still unclear to what extent these findings are transferable to other populations. Furthermore, due to the fact that cross-sectional data was used, longitudinal effects and causal conclusions between work interruptions and the (negative) effects are not possible. Furthermore, the data show on the one hand that the majority of participants rate their well-being as very good, and on the other hand their affinity for technology as very high, which may explain the low explanation of variance.

Nevertheless, the study highlights the complexity of work interruptions and their effects in digital workplaces. The goal should therefore be to provide individualised support based on employees' individual skills and abilities in order to maintain mental and physical health in the long term.

5. Acknowledgements

This survey has been conducted within the project WorkingAge, funded by the European Union's Horizon 2020 Research and Innovation Program under Grant Agreement No. 826232. The analysis has been conducted within the project AKzentE4.0 by the German Federal Ministry of Education and Research (BMBF) within

the “The Future of Value Creation – Research on Production, Services and Work” program and managed by the Project Management Agency Karlsruhe (PTKA), grant 02L19C400.

6. References

- Baethge A, Rigotti T, Roe RA (2015). Just more of the same, or different? An integrative theoretical framework for the study of cumulative interruptions at work. *European Journal of Work and Organizational Psychology*, 24(2), 308–323. <https://doi.org/10.1080/1359432X.2014.897943>
- BAuA. (2020). *Stressreport Deutschland 2019: Psychische Anforderungen, Ressourcen und Befinden*. Dortmund. <https://www.baua.de/DE/Angebote/Publikationen/Berichte/Stressreport-2019.html>
- Davidson R, MacKinnon JG, others. (1993). *Estimation and inference in econometrics* (Vol. 63). Oxford New York.
- Greengard S (2009). Facing an age-old problem. *Communications of the ACM*, 52(9), 20–22.
- Hacker W (2003). Action regulation theory: A practical tool for the design of modern work processes? *European Journal of Work and Organizational Psychology*, 12 (2), 105–130.
- Hayes AF (2022). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A regression-based approach* (Third edition). *Methodology in the social sciences*. The Guilford Press.
- Iqbal ST, Horvitz E (Eds.). (2007). *Lecture Notes in Computer Science. Conversations Amidst Computing: A Study of Interruptions and Recovery of Task Activity*. Springer. https://link.springer.com/chapter/10.1007/978-3-540-73078-1_43 https://doi.org/10.1007/978-3-540-73078-1_43
- Kirakowski J, Corbett M, Sumi M (1993). The software usability measurement inventory. *Br J Educ Technol*, 24(3), 210–212.
- Leiner DJ (2019). Too Fast, too Straight, too Weird: Non-Reactive Indicators for Meaningless Data in Internet Surveys. Advance online publication. <https://doi.org/10.18148/SRM/2019.V13I3.7403> (229–248 Pages / Survey Research Methods, Vol 13 No 3 (2019)).
- Lincke H-J, Vomstein M, Lindner A, Nolle I, Häberle N, Haug A, Nübling M (2021). COPSOQ III in Germany: validation of a standard instrument to measure psychosocial factors at work. *Journal of Occupational Medicine and Toxicology*, 16(1), 1–15.
- Marulanda Carter L, Jackson TW (2012). Effects of email addiction and interruptions on employees. *Journal of Systems and Information Technology*, 14(1), 82–94. <https://doi.org/10.1108/13287261211221146>
- Puranik H, Koopman J, Vough HC (2020). Pardon the Interruption: An Integrative Review and Future Research Agenda for Research on Work Interruptions. *Journal of Management*, 46(6), 806–842. <https://doi.org/10.1177/0149206319887428>
- Rigotti T (2016). *Psychische Gesundheit in der Arbeitswelt: Störungen und Unterbrechungen*. Dortmund. <https://www.baua.de/DE/Angebote/Publikationen/Berichte/F2353-1e.html> <https://doi.org/10.21934/baua:bericht20160713/1e>
- Semmer N, Zapf D, Dunckel H (1999). Instrument zur stressbezogenen Tätigkeitsanalyse (ISTA). *Handbuch Psychologischer Arbeitsanalyseverfahren*, 14, 179–204.
- Shamon H, Berning C (2019). Attention check items and instructions in online surveys with incentivized and non-incentivized samples: Boon or bane for data quality? *Survey Research Methods*, 55–77.
- Stansfeld S, Candy B (2006). Psychosocial work environment and mental health—a meta-analytic review. *Scandinavian Journal of Work, Environment & Health*, 443–462.
- Tams S (2017). A refined examination of worker age and stress: explaining how, and why, older workers are especially techno-stressed in the interruption age. In *Information systems and neuroscience* (pp. 175–183). Springer.



Gesellschaft für Arbeitswissenschaft e.V.

Nachhaltig Arbeiten und Lernen

**Analyse und Gestaltung lernförderlicher
und nachhaltiger Arbeitssysteme
und Arbeits- und Lernprozesse**

69. Kongress der
Gesellschaft für Arbeitswissenschaft e.V.

Gottfried Wilhelm Leibniz Universität Hannover

01. – 03. März 2023

GfA-Press

Bericht zum 69. Arbeitswissenschaftlichen Kongress vom 01. – 03. März 2023

**Fakultät Maschinenbau, Institut für Berufswissenschaften der Metalltechnik (IBM) und
Institut für Fabrikanlagen und Logistik (IFA), Leibniz Universität Hannover**

Herausgegeben von der Gesellschaft für Arbeitswissenschaft e.V.
Sankt Augustin: GfA-Press, 2023
ISBN 978-3-936804-32-4

NE: Gesellschaft für Arbeitswissenschaft: Jahresdokumentation

Als Manuskript zusammengestellt. Diese Jahresdokumentation ist nur in der Geschäftsstelle (s. u.) erhältlich.

Alle Rechte vorbehalten.

© GfA-Press, Sankt Augustin

Schriftleitung: Prof. Dr. Rolf Ellegast

im Auftrag der Gesellschaft für Arbeitswissenschaft e.V.

Ohne ausdrückliche Genehmigung der Gesellschaft für Arbeitswissenschaft e.V. ist es nicht gestattet:

- den Kongressband oder Teile daraus in irgendeiner Form (durch Fotokopie, Mikrofilm oder ein anderes Verfahren) zu vervielfältigen,
- den Kongressband oder Teile daraus in Print- und/oder Nonprint-Medien (Webseiten, Blog, Social Media) zu verbreiten.

Die Verantwortung für die Inhalte der Beiträge tragen alleine die jeweiligen Verfasser; die GfA haftet nicht für die weitere Verwendung der darin enthaltenen Angaben.

Geschäftsstelle der GfA

Simone John, Tel.: +49 (0)30 1300-13003

Alte Heerstraße 111, D-53757 Sankt Augustin

info@gesellschaft-fuer-arbeitswissenschaft.de · www.gesellschaft-fuer-arbeitswissenschaft.de

Screen design und Umsetzung

© 2023 fröse multimedia, Frank Fröse

office@internetkundenservice.de · www.internetkundenservice.de