STUDY PROTOCOL

Causes and consequences of psychological stress in the working life and emergency services of veterinary professionals in the Federal Republic of Germany: A protocol for a nationwide cross-sectional study [version 1; peer review: 1 approved with reservations]

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Abstract

Background: Veterinarians are exposed to high workloads. International studies show they have an above-average risk of suicide and burnout. Hardly any studies dealing with causes and consequences of workload and emergency services are available in Germany.

Methods: The aim of the observational cross-sectional study presented here is to assess their workloads and working conditions (Slesina questionnaire), health situation and well-being (KÖPS questionnaire - physical, psychological and social symptoms; Maslach Burnout Inventory MBI-GS; WHO-5 well-being index), as well as occupational psychological aspects (irritation scales; overcommitment; questionnaire on work-related behavior and experience patterns AVEM) which will be recorded and analyzed according to general sociodemographic and occupational data (sector-, gender, assignment- and country-specific). In addition, the heart rate variability of some members of the veterinary profession will be analyzed using 24 hour electrocardiogram recordings, which together with the subjective insights into the stress situation from the questionnaires, will allow objective psychophysiological stress analyses.

Conclusions: The results of the study will provide further empirical insights into the workloads and stresses faced by the veterinary profession in Germany, based on which important insights into this professional group's mental health can be identified. In this way, it should be possible to identify (mis)stress-triggering factors in the target groups, derive target group-specific recommendations for

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1. **Oliver Hirsch** , FOM University of Applied Sciences, Siegen, Germany

Any reports and responses or comments on the article can be found at the end of the article.

health-promoting work design, and identify approaches to veterinary studies and career selection.

Keywords

study protocol, veterinarians, workloads, psychological stress, heart rate variability

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Introduction

Veterinarians' stressful work situation, the permanently high demands made on the services provided and on themselves, the high level of responsibility and the economic pressure in veterinary practice, do not entirely correspond to society's view of this profession. This also applies to the expectations that people have of veterinary medicine when choosing a profession.

The number of veterinarians practicing veterinary medicine in Germany was 32,582 as of December 31, 2020, of whom 22,121 (67.9%) were female.¹ 765 of the 881 veterinary medicine students who successfully passed the state examination in 2020, were female (86.8%) (plus 41 foreign students, of whom 33 were female).¹ Therefore, for the purposes of health research, it should be noted that the gender ratio in veterinary medicine is much skewed.

Numerous studies, mainly international, have specifically confirmed psychological distress and an increased prevalence of depressiveness and suicidality or suicide risk among practicing veterinarians.²⁻⁴ A review showed that those most at risk for exhibiting suicidal ideation, mental health problems, and dissatisfaction with the profession are predominantly young and female veterinarians.⁵ The relationship between poor working conditions and negative long-term stress outcomes is also presented in the literature.⁵ For example, in her survey, Geuenich⁶ also reports that psychosomatic complaints occur in 38% of the surveyed veterinarians who work more than 45 hours per week. Stress-related alcohol and medication consumption could also be identified and are possible adverse health reactions to job-related stress. A recently conducted online survey on veterinarians' suicide risk confirmed an increased prevalence of suicide compared with the general population and examined veterinary professionals' work stresses, controlling for age and gender.⁴ Early career veterinarians are under permanently high pressure to perform, both in the context of practice management and in relation to the animal's owner. Permanent stress increases the risk of accidents. Studies in veterinary educational institutions also indicate that students have high levels of stress in several areas of life.⁷

The Federal Association of Veterinary Medicine Germany (BVVD 2020) calls for mental health issues to no longer be accepted as a social taboo in veterinary medicine studies and urges the creation of a common awareness of this sensitive topic, and exchange and cohesion among members of the profession. A subjective perception of one's own efficiency as well as one's competence for self-fulfilment and to deal with stressful situations are not only important during one's veterinary studies but also later when practicing in the profession. In terms of preventive medicine, it makes sense to learn such competencies early in veterinary school and to adapt and optimize them throughout one's professional life. A study in veterinary practice showed that there is a relationship between well-developed communication skills and job satisfaction while studying, retention in the profession as a veterinarian, client satisfaction, reduced litigation, and veterinarians' financial compensation.⁸

The results of the empirical study on stress and substance use (tobacco, alcohol, medication) carried out as part of a joint effort by the University of Applied Sciences and the Professional Association for Health Services and Welfare Care (BGW),⁹ show that on average, veterinarians are generally not affected much by psychosocial stress and demoralization. However, these results suggest that stress is mainly triggered by long working hours and dealing with difficult customers. The alcohol consumption in the survey was higher than in the general population; in particular, the alcohol consumption by women was more often risky or dangerous. Severe psychosocial stress and emotional tension are often associated with increased alcohol consumption and substance abuse in studies. In an online survey conducted by the German Veterinary Journal and the German Medical Association in November 2010, nearly 6% of the 2,642 veterinarians surveyed reported significant to heavy stress-related alcohol and/or medication use.¹⁰ A study from England showed that although veterinarians drink more frequently than the general population, they consume less on an ordinary day. The prevalence of daily and weekly binge drinking is similar to that of the general population.¹¹

Psychobiological mechanisms play a role in the pathogenesis of many diseases associated with work-related stress. Different psycho-neurophysiological mediation pathways, such as the autonomic nervous system (ANS), the endocrine system and the immunological system, are responsible for maintaining internal homeostasis in stressful situations. A disbalance between sympathetic and parasympathetic regulation can be objectified using heart rate variability (HRV) as a parameter of autonomic heart function and general activation in one of the organism's complex autonomic regulatory systems. Lower HRV is associated with deviant regulatory mechanisms and impaired adaptive cardiovascular system capacity (CVS).

The need for further surveys and analyses of workloads and stresses among physicians working in veterinary medicine is the subject of the nationwide study, *Causes and consequences of psychological stress in the working life and emergency services of veterinary professionals in the Federal Republic of Germany*. This will take into account factors that have never, or hardly ever, been considered so far, including emergency service participation and differences between rural and

urban veterinarians. Furthermore, additional physiological stress parameters could provide information about stressful work situations for veterinarians through HRV analyses.

Objectives

Following an introductory comparative analysis of the work situation, the aim of the study is to analyze the physical and psychological stresses and strains affecting the professional group of veterinarians in different areas (small animals, horses, livestock, laboratory area and authorities). This will take into account possible influencing factors, such as age, gender, educational and professional biography, working environment (big city, small town, rural area) and the federal state, as well as examining the influence of these factors on the employees' health.

Further aims are to analyze the causal relationship between workload and health consequences, to identify the role of organizational factors in emergency services, and to derive target group-specific recommendations for action on health-promoting work design.

This results in the following central questions guiding the research:

- To what extent do stresses, strains and resources differ among veterinarians in different fields?
- What are the influencing factors and predictors of occupational stress and strain?
- What influence do work-related behavior, experience patterns and the handling of stressful situations have on veterinary professionals' mental health?
- To what extent do stressful situations during emergency service differ between veterinarians in different areas? Are there differences between an emergency service in rural areas and in the city?
- To what extent do the subjective assessment and objective determination of the stress experienced in stressful situations correspond?
- Which target group (occupational group areas, e.g., small animals, horses, livestock, laboratory area and authorities; areas of application, e.g., big city, small town, rural area; age and gender) specific recommendations for action for health-promoting work design can be derived from this?
- How should the data from Germany be assessed in an international comparison?

Methods

The protocol was developed with close reference to the **STROBE** checklist.

Study design

The study consists of an observational cross-sectional design and is divided into 2 parts (Part A and Part B), each with subjective and objective data collection instruments. Part A of the study consists of an online survey (July 01, 2021 to January 31, 2022). The longer survey period makes it possible for veterinarians who have been ill for a longer period of time to participate in the study. In addition, the nationwide survey should avoid a selection bias. The online survey reduces responses in terms of social desirability, as these can only be evaluated anonymously. Answers to specific questions which were developed for this study, about socio-demographic data, job characteristics and organizational conditions are recorded in such a way that comparisons between various specific target group are possible. This means that account must be taken in all areas of veterinary practice (small animals, horses, livestock, laboratory area and authorities) and especially in emergency services, we must take into account aspects such as area (big city, small town, rural area), gender, assignment, country specifics, contexts of professional development, and work organization.

Furthermore, selected standardized instruments for recording stress and strain (as well as other relevant constructs such as well-being, etc.) will be included. In addition, standardized questionnaires about handling stressful situations and willingness to expend energy will also be used. All questionnaires used are standardized valid procedures. The full list of questionnaires used for this study are as follows: questionnaire according to Slesina,¹² KÖPS Questionnaire,¹³ MBI-GS,¹⁴ WHO-5,¹⁵ IS,¹⁶ OC,¹⁷ AVEM,¹⁸ DSI¹⁹ and the MIGA-Heart Questionnaire.²⁰ Some of the questionnaires (KÖPS, AVEM, DSI) can be evaluated with the **Vienna Test System** (version 8, Company Schufried, Mödling, Austria), however the software is not necessary.

Part A (online survey; software SoSci program version 3.2.03-i)

1. Socio-demographic data, occupational history, working conditions
 - a. General information and socio-demographic data (e.g., age, gender, etc.)
 - b. Information about the respondent's professional situation
 - c. Information about workload and working conditions (questionnaire according to Slesina).¹² Main variables: Subjective physical workloads (for example: noise, posture, odors, overtime)
2. Questions about the respondent's health and well-being.
 - a. Information about the respondent's health situation: physical, psychological and social symptoms (KÖPS).¹³ Main variables: mental impairments, physical impairments, and social-communicative impairments.
 - b. Maslach-Burnout-Inventar (MBI-GS).¹⁴ Main variables: emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA). Burnout risk according to Kalimo *et al.*²¹
 - c. WHO Well-being (WHO-5).¹⁵ Main variables: 'I have felt cheerful and in good spirits', 'I have felt calm and relaxed', 'I have felt active and vigorous', 'I woke up feeling fresh and rested' and 'My daily life has been filled with things that interest me'
3. Occupational medicine-psychological section
 - a. Irritation scales (IS).¹⁶ Main variables: mental fatigue and mental illness
 - b. Overcommitment (OC).¹⁷ Main variables: Effort and reward
 - c. Questionnaire on work-related behavior and experience patterns (AVEM).¹⁸ Main variables: Pattern G (Healt), Pattern S (Unambitious), Pattern A (Overexertion) and Pattern B (Burnout)

Part B consists of psychophysiological examinations (01 October 2021 to 31 March, 2022). The subjects' 24-hr Electrocardiogram (ECG) recordings (medilog® AR12 PLUS, Fa. SCHILLER, Baar, Switzerland); provide a basis for the HRV analysis. The RR or Normal-to-Normal (NN) time series are processed with the software medilog® DARWIN2 Enterprise Version 2.9.2 for the total recording time (for example with 24 hours recordings), and an artifact correction is performed. An alternative software that can provide an equivalent function is the custo flash 500/510/510V (custo med GmbH, Ottobrun, Germany). HRV parameters are calculated from these data using Kubios HRV 3.3.1 software (University of Eastern Finland, Kuopio, Finland). An alternative that can provide an equivalent function is the HRV-Scanner Version 3.0 (BioSign GmbH, Ottenhofen, Germany). HRV analyses are performed according to the guideline for the application of heart rate and heart rate variability in occupational medicine and occupational science²² and with the same recording period and recording lengths to avoid bias in the analyses. HRV analysis is performed in the time and frequency domain and with nonlinear methods. Table 1 provides an explanation of the HRV parameters used.^{22,23}

Subjects who participate in the HRV analysis will complete the standardized MIGA-Heart questionnaire²⁰ to assess the factors which influence HRV, in addition to the Differential Stress Inventory (DSI) questionnaire,¹⁹ which is also standardized, to assess and classify the individual's experience of stress. Both questionnaires are completed immediately before the HRV recording period. The goal is to obtain a 24-hr emergency/standby ECG recording and a 24-hr non-emergency/standby recording for each subject. In addition, the subjects will keep a log to document their daily activities (for example, sleep times).

Part B

1. Psychophysiological examinations
 - a. Per subject, two long-term (24-hr) ECG with subsequent analysis of HRV.

Table 1. Explanation of the heart rate variability (HRV) parameters used.^{22,23}

HRV parameters	Explanation	Activity as part of the autonomic nervous system
Time domain parameters		
Mean HR [1/min]	Mean Heart rate	sympathetic and parasympathetic nervous system
Mean RR or NN [ms]	Mean distance between two R-pins or RR intervals or NN intervals	no clear assignment
RMSSD [ms] (Root Mean Square of successive differences)	Square root of the mean of the sum of all squared differences between adjacent RR intervals.	parasympathetic nervous system
NN50	Number of consecutive RR intervals that differ from each other by more than 50 ms.	parasympathetic nervous system
Frequency domain parameters		
FFT_LF_po [ms ²]	Power density spectrum in the low frequency range from 0.04 to 0.15 Hz (Fast Fourier Transformation)	sympathetic and parasympathetic nervous system
FFT_HF_po [ms ²]	Power density spectrum in the high frequency range from 0.15 to 0.40 Hz (Fast Fourier Transformation)	parasympathetic nervous system
FFT LF/HF	Quotient of LF and HF	sympathetic and parasympathetic nervous system
Stress, PNS, and SNS index		
Stress index	The stress index is the square root (to make the index normally distributed) of the Baevsky stress index, where values between 150-500 are claimed as the normal range (12.2-22.4 when the square root is applied)	sympathetic nervous system
PNS index	Activity of the parasympathetic nervous system described by the mean values of RR, RMSSD, and Standard Deviation SD1 (%)	parasympathetic nervous system
SNS index	Sympathetic nervous system activity described by mean values of Mean HR, Stress Index, and Standard Deviation SD2 (%)	sympathetic nervous system

- b. MIGA-Heart questionnaire to assess the factors influencing HRV.²⁰ Main variables: Socio-demographics and factors influencing HRV (for example: Taking medication, physical activity, body mass index (BMI)).
- c. DSI.¹⁹ Main variables: Type I (normal type), Type II (overstressed), type III (stress resistant), type IV (low stress/high coping) and type V (high stress/high coping).
- d. Protocol of the activity during the 24-hr

Study population

The study population consists of practicing veterinarians in Germany. For organizational reasons, the planned HRV analyses are limited to the region in and around Magdeburg in the federal state of Saxony-Anhalt, Germany.

Recruitment

The recruitment is done by advertising the study through the [German Veterinary Association](#), the state veterinary associations and through additional information in the journal *Deutsches Tierärzteblatt* (issue 09/2021), as well as via social media (Facebook, Instagram). In addition to a link to the study, a QR code has also been generated so that subjects willing to participate can access the online survey directly.

The veterinary community in Magdeburg (capital of Saxony-Anhalt) and the surrounding area will be contacted directly regarding the planned psychophysiological examinations (HRV analysis), using the veterinary practices' e-mail.

Inclusion criteria

The study will include veterinarians who work in a wide variety of fields in the Federal Republic of Germany (small animals, horses, farm animals, laboratory field and public authority) and who have been working in their fields for at least one year.

The inclusion criteria for subjects for part B (the HRV analyses using ECG recordings) are based on the S2k guidelines for the use of heart rate and heart rate variability in occupational medicine and occupational science.²⁰

Exclusion criteria

In general, trainee veterinarians (veterinary students) and veterinarians with less than one year of active professional experience will not be included in the study.

Subjects will be excluded from Part B of the study (ECG recording) for the following reasons: Cardiac arrhythmias, cardiac disease, diabetes mellitus, untreated thyroid disease and treated thyroid disease with thyroid blood levels outside the normal range and sustained use of medications affecting cardiac rhythm (e.g., beta-blockers, alpha-receptor blockers, calcium antagonists, ACE inhibitors). A further exclusion criterion for the HRV analysis is a number of (ventricular and supraventricular) extrasystoles greater than 1% of all cardiac actions.^{22,24} Therefore, subjects who do not have any known cardiac arrhythmias but have more than 1% of extrasystoles in the ECG, will also be excluded from the statistical analysis of HRV data.

Sample size calculation

Sample size was calculated using the [Hemmerich-StatistikGuru](#) (version 1.96). An open-access alternative that can provide an equivalent function is the [G*Power](#) program (version 3.1.9.7, Heinrich-Heine-University Düsseldorf, Düsseldorf, Germany).

Previous studies of the professional group were used for the case number analysis.^{4,9} The following parameters were considered in the case number design: Test = single-factor analysis of variance (ANOVA); Number of groups = 4 (Field of activity) or 8 (Field of activity and sex); Type of power analysis = *A priori*; Tails = Two; Effect size $\eta^2 = 0.06$ (medium effect); Alpha level α err prob = 0.05; Statistical power ($1 - \beta$ err prob = 0.8). The number of subjects needed would be 44 (Field of activity) or 29 (Field of activity and sex) per group (A total of 176 and 232, respectively). These findings, as well as experience of the frequency with which the exclusion criteria for HRV analysis occurred, were used for our own sample size analysis. The quantitative survey was conducted in two parts: Part A) the online survey of the total sample (minimum $n = 232$) and Part B) additional determination of HRV from the 24-hr ECG recordings on a smaller sample from Magdeburg and the surrounding area (minimum $n = 20$).

Data management and data protection

The data collected from the participating subjects are anonymized, the assignment of the data from part A to the data of part B is done according to an entered 6-digit code, which is only known to the participant. The evaluation of the questionnaires and the ECG/HRV data is carried out by scientific staff of the Occupational Medicine Department in compliance with the obligation to maintain confidentiality as well as the General Data Protection Regulation and the Federal Data Protection Act.

Data analysis and statistical approach

The first main analyses will be descriptive with missing values being excluded. We will use the Wilcoxon test (for continuous parameters) to make comparisons between groups.

The comparisons will be made within occupational groups of veterinarians working in different fields (small animals, horses, farm animals, laboratory field and authorities), and will take into account the possible influencing factors such as age, gender, own educational and occupational biography, working environment (big city, small city, rural area) and German state, and their influences on the employees' health.

The comparison of the mean values is carried out using either a t-test for normally distributed interval-scaled variables (in the case of two independent groups) or covariance analyses ANOVA (in the case of more than two independent groups). The non-normally distributed or ordinal scaled variables are calculated using the Mann-Whitney test and Kruskal-Wallis test, respectively.

Multiple testing procedures are used for the statistical analyses of the effect relationship of workload and health consequences in order to elaborate the role of organizational factors in emergency services and so that target group-specific recommendations can be derived for taking action on health-promoting work design.

The significance level α is set at 5%. Corrections are made in each case using Bonferroni-Holm correction, to avoid α -error accumulation in the HRV parameters.

Statistical analysis of the data is performed using the **SPSS** program version 26 (IBM, Armonk, NY, USA). An open-access alternative that can provide an equivalent function is the **R stats** package (R Project for Statistical Computing). The evaluation of the KOEPS, AVEM and DSI questionnaires is computer-assisted, using the **Vienna Test System** (version 8, Company Schufried, Mödling, Austria). Alternatively, the questionnaires can be evaluated manually.

Ethics statement

The study (parts A and B) has been approved by the Otto-von-Guericke University Magdeburg ethics committee (No. 91/21). All those participating in parts A and B of the study do so voluntarily. For Part A (online survey), a link is available to the subjects, which is filled out and evaluated anonymously. This is done without consent. The subjects provide written informed consent for participation in Part B after they have been informed in detail about the procedure, risks and objectives of the ECG recording. The subjects will be given an information sheet and an informed consent form for this purpose. The subjects give their consent to participate in the form of a signature on the consent form provided for this purpose. In both parts of the study (parts A and B), the subjects are informed that their data will be analyzed anonymously and used for publications without drawing any conclusions about their personal details. If requested, the subjects receive the evaluation of their ECG results.

The results of the study will be published in international occupational science and occupational medicine journals (also open access/open source) and in practice-oriented journals, such as the *Deutschen Tierärzteblatt*, as well as other publication organs. In addition, the findings of this study may be shared in the context of relevant training courses (veterinary medicine at various locations, human medicine at the Otto von Guericke University Magdeburg, health promotion/health management and health promoting organizational development at the University of Applied Sciences Magdeburg/Stendal). The study can be viewed in the German Register of Clinical Studies under the registration number **DRKS00026106**.

Study status

The online survey has been active since 15/06/2021. At the time of writing, $n = 642$ subjects have participated in the survey (as of 13/09/2021). The recruitment of subjects for the 24-hr ECG recordings needed for part B will begin in October 2021. The expected end date of the study is 30/06/2023.

Conclusions

The study reflects a nationwide target group specific survey on stress and strain among veterinarians in Germany. Due to its use of seven validated questionnaires (plus an eighth, the DSI, for the 24-hr ECG recordings), the study has a broad design to better understand the causes and consequences of the work situation in the veterinary profession. This is an addition to the limited number of studies in Germany related to the mental health of veterinarians and may provide important insights into relevant work demands, work resources and personal resources, as well as the risk of burnout among veterinarians. This target group comparison allows new insights to be gained in the field of stress/strain research in this professional group. Socio-demographic developments, such as age structure, marital status, professional situation, self-employment, differences in emergency service between urban and rural areas, and their effects, for example, on stress situations in emergency service and the health of the increasingly "female" veterinary profession, have not yet been adequately researched. Therefore, they are also collected in this study and taken into account in the statistical analyses. In her research, Kersebohm²⁵ raises the proposition that demographic changes are also accompanied by changing demands on working conditions. Future research could pursue this point, also in connection with the prevention of the negative health effects of mental stress. Many factors may play a role, such as changes in gender redistribution or demographic shifts in the age structure (employment into old age in the veterinary profession: according to the 2019 statistics of the state/veterinary chambers,²⁶ the number of veterinarians working in the 60-69 age group was 6,290, in the 70-79 age group 3,488, in the 80-90 age group 2,020, and 311 in the over 89 age group) and/or different stress levels in the different veterinary fields.

By including the HRV analysis, a measurement method recognized within occupational medicine and science, the study has also expanded to include objective physiological stress parameters. This allows comparative stress analyses to be made between emergency services and a baseline of "normal" working days.

The everyday stress situation with long working days could be exacerbated by subsequent emergency service, leading to low job satisfaction and health impairments. (Incorrect) exposure to work stressors can be reduced through work-related and individual resources, social support, and using health-promoting work and behavioral practices. Organizational, social, and personal resources are considered compensatory and protective components. A strategy to prevent the long-term consequences of psychological stress can only be achieved by considering health risks and resources together.²⁷

The risk assessment of mental stress, which is obligatory under occupational health and safety laws, is essential for detecting veterinarians' mental problems in the workplace. Prevention of mental illness and health promotion can generally only be done well if the triggering demands and mental stress are counteracted. In addition, negative short-term consequences of stress should be recognized as early as possible so that the respective person can be helped at an early stage, thus directly preventing negative long-term consequences of stress which could necessitate early retirement.

Data availability

No data are associated with this article.

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Oliver Hirsch

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First, it should be mentioned that the authors' approach of conducting an occupation-specific study of psychological stress in veterinarians is very important, as it has been shown that there are specific burdens in different medical specialties to which appropriate interventions must be tailored.

Introduction

Informative and generally well-written.

Please include more concrete empirical data from prior research, e.g., "A recently conducted online survey on veterinarians' suicide risk confirmed an increased prevalence of suicide compared with the general population...." By how much was the suicide risk increased? Please include a citation in paragraph regarding heart rate variability (HRV).

Objectives

"Further aims are to analyze the causal relationship between workload and health consequences...." You are performing an observational study but you want to analyze a causal relationship. This is a contradiction. Please elaborate on this.

Study design

"the nationwide survey should avoid a selection bias" How do you ensure this? Do you have membership data of a professional organisation with which you can compare certain characteristics of your sample, e.g., gender and age distributions?

All questionnaires used must be described much more precisely (rationale for their selection, their structure, test-theoretical quality criteria such as reliability and validity), also including MIGA-Heart questionnaire and Differential Stress Inventory (DSI). Were there any preliminary studies with

these questionnaires in the veterinary area or comparable areas?

Sample size calculation

You intended to also analyze other demographic factors like working environment (big city, small town, rural area). How are they incorporated in the sample size calculation? I propose to consider alternative analyses like Partial Least Squares Structural Equation Modeling (PLS-SEM).

Please explain further sample size calculation for Part B (minimum $n=20$?).

Data analysis

"missing values being excluded" Missing value analysis and imputation should be considered. There is a sound empirical basis that just excluding missing values induces bias.

The description of the intended statistical data analyses should be more concrete. The authors state "and will take into account the possible influencing factors such as age, gender, own educational and occupational biography, working environment (big city, small city, rural area) and German state, and their influences on the employees' health". How specifically should this be done? Simply listing procedures is unfortunately not sufficient. I refer again to the possibility to consider other analysis methods (e.g. PLS-SEM).

Study status

Why is the study protocol to be published while the study has already started and not in advance?

Is the rationale for, and objectives of, the study clearly described?

Yes

Is the study design appropriate for the research question?

Partly

Are sufficient details of the methods provided to allow replication by others?

Partly

Are the datasets clearly presented in a useable and accessible format?

Not applicable

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Research Methods, Statistics, Occupational Medicine, Biological Psychology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

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