PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	The moderating role of personal resources in the relationship between psychosocial job demands and health: A cross-sectional study
AUTHORS	Mayerl, Hannes; Stolz, Erwin; Großschädl, Franziska; Rásky, Éva; Freidl, Wolfgang

VERSION 1 - REVIEW

REVIEWER	Laura Schwab Reese University of Colorado, Anschutz Medical Campus Colorado, USA
REVIEW RETURNED	03-Feb-2017

GENERAL COMMENTS	I appreciate the opportunity to review this manuscript, which focused on the associations of the interactions between individual resources and job demands with the outcome of mental and physical health. In my opinion, it is important to understand how personal and professional resources and demands influence health so I was pleased to review this manuscript. Overall, I am pleased with the introduction and discussion sections of the manuscript. These sections are concise while providing enough detail about the issues. I have some minor questions/concerns about the methods and results sections. 1. It would be helpful to have additional information about the measures. For example, is body mass index based on self-report or objective assessment or height and weight. Overall, I would like to have, perhaps in an appendix, the text of the questions included in each variable to better understand what is included in the variables. 2.I would also like more information about the treatment of each variable or group of variables in the models. Are health symptoms included in the model as the mean response to all the potential health symptoms or a different treatment? This could also information be included in an appendix. 3. I am able to infer, based on the interactions, that Table 2 is adjusted for all the variables included in the table, but it would be nice to have confirmation of the variables included in the model in the table notes. 4.Figure 1 is very difficult to understand. It would be helpful to use different shades of gray or perhaps patterns to better distinguish between groups.

	5. Finally, I noticed that the job resources: rewards measure has a much higher level of missingness than the remaining variables. Do you know or can you hypothesize why this is and if it has any implications for bias in this measure?

REVIEWER	Maria Nordin Umeå University, Sweden
REVIEW RETURNED	02-Mar-2017

GENERAL COMMENTS	I think your study is promising and enters an important field. I think the manuscript is a welcomed contribution with many qualities, it just needs a little more work. Good Luck with the revision!

REVIEWER	Giridhara R babu Additional Professor, Public Health Foundation of India, Bangalore
REVIEW RETURNED	21-Mar-2017

GENERAL COMMENTS	This is an important paper. However, a review by statistical expert might be warranted before it is accepted for publication.

REVIEWER	Lisa Mather Karolinska Institutet, Sweden
REVIEW RETURNED	21-Mar-2017

GENERAL COMMENTS	Overall, I think this is a well conducted and well written study. The study questions are very interesting, the hypotheses are clearly stated and answered and the large representative sample is a main strength. However, I do have some concerns and comments. My main concern is that the measurements of somatic health are somewhat problematic, they are said to be perceived health symptoms and BMI (row 21, page 5). However, the measurement of perceived health symptoms contains questions regarding how often in the last weeks the participant had suffered from hypertension and tachycardia. Neither of these are perceived health symptoms, but signs that can be easily measured and can be silent i.e. is not always felt by the individual when they occur. I also find it problematic that BMI is used as a continuous variable. Is it relevant weather a person has a BMI of 20 or 25 since they are both in the normal range? BMI is also a crude measure as it does not take into account muscle mass. I think the reasoning for including BMI as an outcome needs to be further explained in the introduction. I would be more inclined to see it as a moderator between high job demands and health, that is highly related to the moderators “physical resources”. The title states that the study is retrospective but when examining the methods, it is based on interview data collected at one timepoint for each individual. Based on this, I would define the study as cross-

	sectional which is also stated in other parts of the article. I think a more appropriate title would be “The moderating role of personal resources in the relationship between psychosocial job demands and health: A cross-sectional study”. In the introduction on row 11 the sentence “Particularly in working contexts stress plays a crucial role” seem to be missing a part. A crucial role for what? Only full-time employed individuals were included in the study, how may this have affected results? I think this should be mentioned in the strengths and weaknesses paragraph. In table 2 P values are stated as being 0.000. I think it would be more appropriate to instead write <0.001 (as in table 1). Common practice is to use 95% confidence intervals, why were 99% confidence intervals used in this study? I think this deserves a mention. In the conclusion; the statement “In highly demanding working environments particularly high physical resources of a person seem to cushion the detrimental effects that psychosocial job demands have on health. Thus the promotion of physical fitness is a higher purpose when it comes to preventing health problems in highly demanding jobs” somewhat contradicts the third conclusion ”Concerning the moderating role of personal resources, only weak evidence was found in that physical resources seemed to attenuate the negative impact of psychosocial job demands on somatic health. Overall, the moderating effects of the personal resources only slightly accounted for the prediction of health outcomes.”

REVIEWER	Sara Viotti University of Turin, Italy
REVIEW RETURNED	10-May-2017

GENERAL COMMENTS	Thank you for the opportunity to review this study with the aim to investigate the buffering effects of an individual’s physical, mental and social resources in the relationship between psychosocial job demands and: (1) health symptoms, (2) mental strain, and (3) the body mass index (BMI) respectively. In general, the study has as a main strength a large sample size. Statistical analyses are adequate for the study aims. However, the study has as a main limitation the cross-sectional design. Here some comments that I hope may help improve the manuscript. 1) JDR model is an adequate framework for these studies. However, you need to better explain why you propose and, most important, which are the added values of extending the model in order to include non-work related resources. Moreover, why you choose to include control and reward only as job resources (and for example why not social support from peers and superiors?) 2) Which is the type of occupations of responders? Can workers be recounted to main categories (e.g. white collars, blue collars/ helping professions/non-helping professions). Or, is the sample homogenous from this point of view? It is important to control the model for the type of occupation in order to avoid bias in study

	findings. 3) I'm not sure that it is correct to use perceived physical constitution as a resource that moderate the relationship between job demands and health symptoms. I mean : If I complaining for one or more diseases then I tend to assess my physical constitution as bad; on the other hand if I don't have any disease then I tend to consider my constitution as excellent. I think that, in order to assess these HPs, you need to develop a two-way study. In this form, it sounds as tautological… 4) Why you include in the regression the main effect of reward and control as distinct elements and then you use their sum (job resource I guess) in the interaction term?

VERSION 1 – AUTHOR RESPONSE

Response to Reviewer 1
Reviewer Name: Laura Schwab-Reese
Institution and Country: University of Colorado, Anschutz Medical Campus, Colorado, USA
Competing Interests: None declared

Dear Dr. Schwab-Reese,
Thank you for your valuable time and constructive criticism. We have addressed all issues indicated. Please find our answers in the following lines.

Reviewer:
I appreciate the opportunity to review this manuscript, which focused on the associations of the interactions between individual resources and job demands with the outcome of mental and physical health. In my opinion, it is important to understand how personal and professional resources and demands influence health so I was pleased to review this manuscript.

Overall, I am pleased with the introduction and discussion sections of the manuscript. These sections are concise while providing enough detail about the issues.

I have some minor questions/concerns about the methods and results sections.

1. It would be helpful to have additional information about the measures. For example, is body mass index based on self-report or objective assessment or height and weight. Overall, I would like to have, perhaps in an appendix, the text of the questions included in each variable to better understand what is included in the variables.

Authors:
We now included further information on the body mass index measure in the main text and we included the texts of all items used in this study in the appendix.

Reviewer:
2. I would also like more information about the treatment of each variable or group of variables in the models. Are health symptoms included in the model as the mean response to all the potential health symptoms or a different treatment? This could also information be included in an appendix.

Authors:
We provided information about the treatment of each variable in the results section of the original

version of this manuscript (psychometric analyses, p. 10, lines 3-9). However, this important information is perhaps more appropriate in the “Measures” subsection of the “Methods” part, so we moved this paragraph to this position.

Reviewer:
3. I am able to infer, based on the interactions, that Table 2 is adjusted for all the variables included in the table, but it would be nice to have confirmation of the variables included in the model in the table notes.

Authors:
Yes, we reported the adjusted coefficients. We now included this information in the table notes.

Reviewer:
4. Figure 1 is very difficult to understand. It would be helpful to use different shades of gray or perhaps patterns to better distinguish between groups.

Authors:
We examined whether different shades of gray help to better distinguish between groups and found that the different colours in the figure provide better distinction. However, we now use different line types for the simple slopes in order to ensure more clarity.

Reviewer:
5. Finally, I noticed that the job resources: rewards measure has a much higher level of missingness than the remaining variables. Do you know or can you hypothesize why this is and if it has any implications for bias in this measure?

Authors:
We can only hypothesize why this measure has more missing data. One reason might be that some employees are satisfied with their current work situation and do not wish to start a successful career or to undertake further training on the job and thus refused to answer these questions. This could explain why there is a higher level of missingness for the items assessing satisfaction with the occupational and training opportunities (5.2%) and with the career and the development opportunities (5.8%), whereas there is a lower level of missingness for the item assessing satisfaction with income (0.1%).
In order to reduce the likelihood for biased parameter estimates and to prevent loss of power, we applied multiple imputation method[1, 2]. Based on the other observed variables in the model, this procedure allowed us to impute plausible values for the missing data, while also accounting for the uncertainty in the imputations. In conclusion, although we cannot completely rule out the possibility for some sort of bias in this measure, we tried to keep the likelihood of biased estimates as low as possible.

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Response to Reviewer 2
Reviewer Name: Maria Nordin
Institution and Country: Umeå University, Sweden
Competing Interests: None declared

Dear Prof. Nordin,
Thank you very much for reviewing our manuscript.

Dear Authors,
I think your study is promising and enters an important field. I think the manuscript is a welcomed contribution with many qualities, it just needs a little more work.
Good Luck with the revision!
Maria

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Reviewer: 3
Reviewer Name: Giridhara R Babu
Institution and Country: Additional Professor, Public Health Foundation of India, Bangalore
Competing Interests: 'None declared'

Dear Prof. Babu,
Thank you very much for reviewing our manuscript.

This is an important paper. However, a review by statistical expert might be warranted before it is accepted for publication.

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Reviewer: 4
Reviewer Name: Lisa Mather
Institution and Country: Karolinska Institutet, Sweden
Competing Interests: None declared

Dear Dr. Mather,
We appreciated your time and effort in reviewing our manuscript and we have addressed all issues as suggested. Please find our answers in the following lines.

Reviewer:
Overall, I think this is a well conducted and well written study. The study questions are very interesting, the hypotheses are clearly stated and answered and the large representative sample is a main strength. However, I do have some concerns and comments.

My main concern is that the measurements of somatic health are somewhat problematic, they are said to be perceived health symptoms and BMI (row 21, page 5). However, the measurement of perceived health symptoms contains questions regarding how often in the last weeks the participant had suffered from hypertension and tachycardia. Neither of these are perceived health symptoms, but signs that can be easily measured and can be silent i.e. is not always felt by the individual when they occur.
I also find it problematic that BMI is used as a continuous variable. Is it relevant weather a person has a BMI of 20 or 25 since they are both in the normal range? BMI is also a crude measure as it does not

take into account muscle mass. I think the reasoning for including BMI as an outcome needs to be further explained in the introduction. I would be more inclined to see it as a moderator between high job demands and health, that is highly related to the moderators “physical resources”.

Authors:
As regards your concerns about “perceived health symptoms” we do agree that this could be misleading. The item assessing heart problems, however, is not limited to tachycardia, but it also asks for palpitations, fast heart beats, or pressure on the breast, all of which can be perceived health symptoms (please also see the revised supplementary materials, where we now included the texts of all items used in this research). However, we do agree that hypertension is difficult to perceive and we thus replaced the term “perceived” by the term “self-reported”, which is perhaps more appropriate in this context.
As regards the treatment of the BMI measure we do not think that it is wrong to use this measure as a continuous variable in this context. Since we were not interested in the distribution of normal weight, overweight, or obesity, but rather wanted to examine whether higher values in job demands go along with higher values in BMI, this approach seems to be appropriate. Kouvonen et al.[8], for example, also used BMI as a continuous measure and found in a linear regression analysis that stress at work was associated with higher BMI. Furthermore, Harding et al.[9] found in a longitudinal study that those individuals experiencing higher levels of psychosocial stress at baseline had a higher increase in BMI than those experiencing lower levels of stress at baseline. Again, they used BMI as a continuous measure. Although it would be also possible to perform logistic regression analysis with BMI as a categorical variable, categorisation of BMI would result in several problems, such as loss of information or reduced power to detect potential relationships. We therefore considered linear regression analysis with BMI as a continuous measure as the method of choice best suited to answer our research questions.
However, we do agree that BMI is a relatively crude indicator for health status, so we added this limitation in the “Strengths and limitations” paragraph.
We do also agree that BMI could be used as predictor or moderator in this context. However, since the prevalence of overweight and obesity is increasing worldwide[10] and increased weight represents a major public health concern, research in this context has gained interest in investigating the determinants of overweight and obesity, and thus consider weight as an important outcome measure instead of a predictor. Since recent evidence suggests that (psychosocial) stress may play a considerable role in weight gain[9], we examined the relationship between work-related stress and BMI, while we especially focused on the moderating effects of personal resources in this context. We now included more information and references on the link between stress and weight in the first paragraph of the “Introduction” section and in the second paragraph of “The current study” section.

Reviewer:
The title states that the study is retrospective but when examining the methods, it is based on interview data collected at one timepoint for each individual. Based on this, I would define the study as cross-sectional which is also stated in other parts of the article. I think a more appropriate title would be “The moderating role of personal resources in the relationship between psychosocial job demands and health: A cross-sectional study”.

Authors:
This is a valid point. We replaced the term “retrospective” by “cross-sectional”.

Reviewer:
In the introduction on row 11 the sentence “Particularly in working contexts stress plays a crucial role” seem to be missing a part. A crucial role for what?

Authors:
We now revised the first two sentences of the particular paragraph as follows: “Particularly in a working context the relationship between stress and health has been extensively investigated and several models have been proposed in order to explain the origins of work-related stress and its consequences[14].”

Reviewer:
Only full-time employed individuals were included in the study, how may this have affected results? I think this should be mentioned in the strengths and weaknesses paragraph.

Authors:
We restricted our analyses to full-time employed individuals in order to avoid bias due to unobserved confounding. In our total sample, about 11.0% of all employees worked 20 hours or less per week and 3.5% of all employees worked 10 hours or less per week. Particularly due to less working hours, we expected part-time employees to considerably differ from full-time employees in factors such as the amount of stress exposure due to paid work, the time to recover from work-related stressors, the work-life balance, or role-conflicts, all of which may be related to health and well-being. For example, in a study of Van Rijswijk, Bekker, Rutte, and Croon[3] it has been shown that part-time work was associated with higher work-family balance which in turn was related to higher levels of well-being. Including both part-time employees and full-time employees would thus require to establish a more complex model, in which these differences are controlled for, in order to avoid bias due to confounding. We thus considered restricting the sample to full-time employees to allow better interpretation of results and to be more appropriate for answering our specific research questions.
A potential limitation of this approach is that our findings only related to employed individuals working full-time and that no inferences can be made on other groups, such as part-time workers or the self-employed. We now included this point in the “Strengths and limitations” subsection at the end of this manuscript and specified the first sentence in the “Strengths and limitations of this study” part at the beginning of the manuscript.

Reviewer:
In table 2 P values are stated as being 0.000. I think it would be more appropriate to instead write <0.001 (as in table 1).

Authors:
Revised! Thank you.

Reviewer:
Common practice is to use 95% confidence intervals, why were 99% confidence intervals used in this study? I think this deserves a mention.

Authors:
Due to the large sample size, we set the significance threshold for hypothesis testing to Alpha=1%, which prevents that trivially small effects get significant. Since hypotheses testing and confidence intervals are highly related, we consistently used this threshold throughout this paper and we thus reported the 100(1 - Alpha)% confidence intervals. Please see the revised sentence in the “Regression analysis” subsection of the “Psychometric and statistical analysis” part, and the added sentence in the table notes of Table 2.

Reviewer:
In the conclusion; the statement “In highly demanding working environments particularly high physical resources of a person seem to cushion the detrimental effects that psychosocial job demands have on health. Thus the promotion of physical fitness is a higher purpose when it comes to preventing health problems in highly demanding jobs” somewhat contradicts the third conclusion ”Concerning the moderating role of personal resources, only weak evidence was found in that physical resources seemed to attenuate the negative impact of psychosocial job demands on somatic health. Overall, the moderating effects of the personal resources only slightly accounted for the prediction of health outcomes.”

Authors:
We meant that although physical resources were found to buffer the negative impact of psychosocial job demands on somatic health, the moderating effect of all three personal resources combined only slightly contributed to explaining the variation in health. We do agree that the wording in the first version of this manuscript could be misleading for readers, so we revised this paragraph to be more concise and less ambiguous.

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Reviewer: 5
Reviewer Name: Sara Viotti
Institution and Country: University of Turin, Italy
Competing Interests: None declared

Dear Dr. Viotti,
Thank you for your valuable time and constructive criticism. We hope that we have addressed all your concerns to your satisfaction.

Reviewer:
Thank you for the opportunity to review this study with the aim to investigate the buffering effects of an individual’s physical, mental and social resources in the relationship between psychosocial job demands and: (1) health symptoms, (2) mental strain, and (3) the body mass index (BMI) respectively.

In general, the study has as a main strength a large sample size. Statistical analyses are adequate for the study aims. However, the study has as a main limitation the cross-sectional design. Here some comments that I hope may help improve the manuscript.

1. JDR model is an adequate framework for these studies. However, you need to better explain why you propose and, most important, which are the added values of extending the model in order to include non-work related resources. Moreover, why you choose to include control and reward only as job resources (and for example why not social support from peers and superiors?)

Authors:
We now revised the introduction section in order to better explain the rational for including personal resources in the model.
The reason why we only considered control and reward as job resources was because these factors relate to the two most influential work-related stress models used in occupational health psychology (along with the JD-R model), namely the job demands-control model and the effort-reward model (see

e.g. [4], [5]). We included this information in the “Measures” subsection. Moreover, there are no further valid scales available in the survey data that can be used as a job resources measure.

Reviewer:
2. Which is the type of occupations of responders? Can workers be recounted to main categories (e.g. white collars, blue collars/ helping professions/non-helping professions). Or, is the sample homogenous from this point of view? It is important to control the model for the type of occupation in order to avoid bias in study findings.

Authors:
Since our data set is representative for the Austrian working population, the sample is not homogeneous, but consists of different occupational groups. We decided not to include occupational groups in our models because we found in another study using a similar data basis that information on the working conditions and the resources (both personal resources and job resources) accounted for potential differences in occupational groups with regard to mental and somatic health. That is, in a structural equation model we showed that the strength and direction of the relationship between psychosocial job demands and health did not differ between occupational groups (blue collar vs. white collar workers), while controlling for both personal resources and job resources[6]. Since we already included a variety of important third variables, we thus followed the principle of parsimony in establishing our research model[7] and favoured a model with a well defined set of predictors over a potentially overfitted model.

Reviewer:
3. I’m not sure that it is correct to use perceived physical constitution as a resource that moderate the relationship between job demands and health symptoms. I mean : If I complaining for one or more diseases then I tend to assess my physical constitution as bad; on the other hand if I don’t have any disease then I tend to consider my constitution as excellent. I think that, in order to assess these HPs, you need to develop a two-way study. In this form, it sounds as tautological…

Authors:
Thank for your comment, this is an important point. Based on your criticism, we further examined our items concerning physical resources and decided to use only two items instead of three items (The results did not change remarkably due to this revision. However, the revised measure allows better interpretation of results.). These two items were used to assess the physical fitness of an individual (please also see the texts of all items in the revised supplementary materials). We consider physical fitness to be a good indicator for physical resources, in the sense that physical fitness may be an important protective factor regarding the negative health consequences of high psychosocial stress. For example, previous research found that physically fitter persons (vs. less fit persons) showed a less strong physiological response to a stressful situation[11] and they recovered faster[12]. In a similar vein, we found in our study that the increase in health symptoms due to psychosocial job demands was less strong in those individuals exhibiting a good physical fitness, compared to those with poor physical fitness. Physical fitness thus seem to buffer the negative impact of psychosocial job demands on somatic health. This interaction effect highlights the buffering role of physical resources in the stress-health link. Considering physical resources and somatic health problems to be two sides of the same coin, in contrast, cannot explain this interaction effect.
However, we do agree that our findings must be interpreted with some caution and that longitudinal studies are needed in order to separate cause from effect. Furthermore, more objective measures (e.g. physical fitness tests) may have led to more reliable results. Please see the revised version of the “Strengths and limitations” paragraph, where we included these limitations.

Reviewer:
4. Why you include in the regression the main effect of reward and control as distinct elements and then you use their sum (job resource I guess) in the interaction term?

Authors:
Since previous research in this context primarily investigated the effects of job resources and often disregarded personal resources, we focused on the main and moderating effects of personal resources in our study. This is why we examined the interaction between the psychosocial job demands and the three personal resources, whereas we did not estimate the interaction effect between the psychosocial job demands and job resources, neither as a composite index nor for job control and job rewards separately.

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References

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VERSION 2 – REVIEW

REVIEWER	Laura Schwab Reese University of Colorado Denver, Colorado, USA
REVIEW RETURNED	27-Jun-2017

GENERAL COMMENTS	I would like to thank the authors for their responsiveness to the concerns raised by the reviewers. In my opinion, the authors have addressed our concerns and the manuscript is suitable for publication.

REVIEWER	Lisa Mather Karolinska Institutet, Sweden
REVIEW RETURNED	25-Jun-2017

GENERAL COMMENTS	Thank you for the response, I feel that my questions and concerns have been answered adequately and addressed in the revised manuscript.