Author's response to reviews

Title: Workplace gender composition and psychological distress: The importance of the psychosocial work environment

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Author's response to reviews: see over
Dear Editor

We would like to thank you for your comment regarding our manuscript. We have now prepared a revised manuscript in accordance with your suggestion. You can find our response below.

Sincerely

Sofia Elwér

**Bold font** = comments from the editor

**Plain font** = authors’ response

**Indented, italicized font** = sections from the revised manuscript

**Your comment:**
My major comment about statistical analysis regarding interaction tests has been taken into account only very partially. I recommended to perform interaction tests to explore whether or not there may be differences between strata. The authors provided the results of interaction tests in a new table. However, although the results showed no significant interaction tests, the results and discussion sections were not revised accordingly. As I stated previously, a non-significant interaction term means that there are no difference between strata. Consequently, the results may be considered similar for all strata, and the results among the whole sample may be enough. Interpreting the differences between strata, as the authors do, is an over interpretation of the results that is statistically incorrect. The results section still needs major revisions as well as the discussion section, that is based on a description of the results according to strata, that lead to a large number of unfounded conclusions and speculations. In addition, the abstract and the analyses section should be revised too.

**Response:**
We have realized that your comment made cause for more pervasive changes of the manuscript than we realized in the former revision. Thank you for allowing us to make these further changes. In line with your suggestion we have now rewritten the result and discussion section according to the interaction analyses that was added in the previous revision. Due to the lack of significant interaction the stratified analyses have been removed from the manuscript. The manuscript is now only focused on analyses of the full sample with tests of interaction. The abstract, method, result, discussion and conclusions section are revised accordingly. While working on these changes we also realised that we wanted to be more explicit in our aim that we are also interested in comparing the prevalence of psychological distress between the gender compositions. We have therefore added this to the aim and included separate multivariate analysis (in a new table 2) for this part of the aim. We think that this addition makes the manuscript more interesting and also easier to follow. We hope
that you agree and if not we are willing to go back to the former aim and remove these added analyses.

The changes in each part are specified below:

We have changed the methods, results and conclusion in the abstract to the following:

(page 2, paragraph 2)
*Questionnaire data were supplemented with register data on the gender composition of the participants’ workplaces divided into three groups: workplaces with more women, mixed workplaces, and workplaces with more men. Associations between psychological distress and gender composition were analysed with multivariate logistic regression analysis adjusting for socioeconomic position, previous psychological distress, psychosocial work environment factors and gender. Logistic regression analyses (including interaction terms for gender composition and each work environment factor) were also used to assess possible mediators.*

**Results:** Working at workplaces with a mixed gender composition was related to a higher likelihood of psychological distress compared to workplaces with more men, after adjustments for socioeconomic position, psychological distress at age 21, psychosocial work environment factors and gender. In addition, working at workplaces with more women was also related to psychological distress, until adjusting for gender. Contextual reactions to the psychosocial work environment factors based on the workplace gender composition could not explain the relations.

**Conclusion:** The association between gender composition and psychological distress cannot be explained by differences in the reaction to the psychosocial work environment and thus the work environment hypothesis is not supported. Workplaces with a mixed gender composition needs further research attention to explain the negative development of psychological distress during working life for both women and men at these workplaces.

In the introduction section we have changed the aim to the following:

(page 5, paragraph 2)
*Our aim was to analyse how workplace gender composition is related to psychological distress and to explore the work environment hypothesis through analysing the importance of the psychosocial work environment for psychological distress at workplaces with different gender compositions.*

In the method section gender composition has been moved from the heading “stratifying variable” to the heading “exposure variable” (as the stratified analyses were excluded). The analyses section has been changed to the following:

(page 7, paragraph 7)
*Percentages for psychological distress, exposure variables and background variables in the three gender compositions were calculated for the full sample as well as for women and men separately (table 1). Differences were analysed with chi-square test. Correlations were tested pairwise with Pearsons test for all*
exposure variables. There were no correlations > 0.33. Crude and multivariate logistic regressions, with psychological distress at age 42 as outcome, were performed in relation to workplace gender composition (table 2) calculating odds ratios with 95 per cent confidence intervals. Workplaces with more men were used as reference categories as they represented the lowest prevalence of psychological distress. In table 3, crude and multivariate regressions with the same outcome were also performed for all work environmental factors adjusting for the gender composition of the workplace. Interaction terms (between gender composition and the work environmental factors) were entered into the analysis in the final model. It would have been preferable with gender stratified multivariate analyses. However, the limited sample size, with few women and men at workplaces where they were in minority, made this impossible. All statistical analyses were performed using SPSS Statistics 19, and the significance level was at 0.05.

In the result section we have added a new table 2 with the analyses for the first part of our aim. The analyses are presented as follows:

\[(\text{page 9, paragraph 3})\]

*The logistic regression (table 2) confirmed associations between gender composition and psychological distress. Employees at workplaces with a mixed gender composition also remained at a higher odds ratio of psychological distress after all adjustments (socioeconomic position, psychological distress at age 21, all psychosocial work environment factors and gender) compared to employees at workplaces with more men. Employees at workplaces with more women did not have a higher OR of psychological distress compared to workplaces with more men when the association was adjusted for gender in the final model.*

<table>
<thead>
<tr>
<th>Gender composition</th>
<th>OR Model 0</th>
<th>OR Model 1</th>
<th>OR Model 2</th>
<th>OR Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>More men (reference)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mixed</td>
<td>2.02 (1.34 – 3.03)</td>
<td>2.17 (1.42 – 3.33)</td>
<td>2.05 (1.31 – 3.21)</td>
<td>1.77 (1.10 – 2.83)</td>
</tr>
<tr>
<td>More women</td>
<td>1.62 (1.14 – 2.29)</td>
<td>1.62 (1.13 – 2.33)</td>
<td>1.71 (1.17 – 2.49)</td>
<td>1.26 (0.79 – 2.00)</td>
</tr>
</tbody>
</table>

Model 0: Bivariate for each exposure
Model 1: Adjusted for socioeconomic position and psychological distress at age 21.
Model 2: Adjusted for socioeconomic position, psychological distress age 21 and all psychosocial work environment factors (high demands, low control, low support, not important work and looked down upon).
Model 3: Adjusted for socioeconomic position, psychological distress age 21 and all psychosocial work environment factors and gender.
In the result section the analyses of the full sample is included in table 3 (former table 2) and presented as follows:

(Page 9, paragraph 3)

Table 3 provides the results from the multivariate logistic regression analysis for psychological distress in relation to each of the work environmental factors. All work environmental factors were associated with psychological distress in the crude analyses as well as in model 1 and 2. With interaction terms included in the model, high demands, low control and low support were still associated with psychological distress. Mixed workplaces also had a higher OR for psychological distress compared to workplaces with more men for all work environmental factors except for the final model of being looked down upon. No significant interactions were found in any model. The results indicate that there were no differences in the association between work environmental factors and psychological distress based on gender composition. The association between gender and psychological distress was also analysed with corresponding analysis (data not shown). The association between gender and psychological distress turned insignificant when the interaction term for gender composition and gender was introduced in the model and no interaction was found.

In the result section we have also removed the former table 3 which is now only described in the text. We leave it up to the editor to decide if this table should be included in the manuscript.

(Page 9, paragraph 3)

The association between gender and psychological distress was also analysed with corresponding analysis (data not shown), the association turned insignificant when the interaction term for gender composition and gender was introduced in the model and thus no interaction was found.

Former table 3: removed from the manuscript:

Table 3: Logistic regression analyses for psychological distress and gender (ORs and 95% CIs).

<table>
<thead>
<tr>
<th></th>
<th>OR Model 0</th>
<th>OR Model 1</th>
<th>OR Model 2</th>
<th>OR Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women (men ref)</td>
<td>1.81 (1.33–2.45)</td>
<td>1.77 (1.29–2.42)</td>
<td>1.55 (1.05–2.28)</td>
<td>1.29 (0.69–2.43)</td>
</tr>
<tr>
<td>Gender composition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
<td>1.95 (1.25–3.04)</td>
<td>1.37 (0.75–2.51)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More women</td>
<td>1.28 (0.83–1.98)</td>
<td>1.70 (0.83–3.47)</td>
<td></td>
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</tr>
<tr>
<td>Interaction term</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gender &amp; gender comp.</td>
<td>2.11 (0.82–5.42)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
<td>0.82 (0.31–2.14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 0: Bivariate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 1: Adjusted for socioeconomic position, psychological distress age 21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 2: Adjusted for socioeconomic position, psychological distress age 21, gender composition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 3: Adjusted for socioeconomic position, psychological distress age 21, gender composition, interaction terms for gender and gender composition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The discussion section is rewritten to the following:

(page 9, paragraph 1)
Working at a workplace with a mixed gender composition was related to a higher likelihood of psychological distress compared to workplaces with more men, even after adjustment for socioeconomic position, psychological distress at age 21, psychosocial work environment factors and gender. In addition, working at workplaces with more women was also related to psychological distress, until adjusting for gender. Contextual reactions to the psychosocial work environment factors based on the workplace gender composition could not explain the relations.

Our findings regarding worse health at mixed workplaces are interesting because they contradict previous research on the occupational level that suggests better health in those few occupations that are gender-integrated [7]. A possible explanation could be that gender composition is measured on different levels – on occupational and on workplace level, and that gender integrated occupations means something different compared to mixed workplaces. Previous research also suggests that women at workplaces with more women are worse off in terms of mental health [8]. In our study the differences in psychological distress between workplaces with more women and workplaces with more men are not significant after adjusting for gender. Our results indicate that the higher likelihood of psychological distress at workplaces with more women in the crude analysis is explained by a compositional effect, i.e. that there are more women at these workplaces, and women as a group have a higher prevalence of psychological distress. However, these results must be interpreted with caution as there are few men at these workplaces and there might not be enough statistical power to detect an association. The descriptive analyses indicate that the prevalence of psychological distress for men at workplaces with more women is at the same level as for women.

Concerning the second part of our aim exploring the work environment hypothesis, our results show that the differences in psychological distress between the three gender compositions could not be explained by differences in the reaction to the psychosocial work environment, and consequently the work environment hypothesis is not supported. Previous research has suggested an influence of gender composition on the association between high strain jobs and sickness absence for both women and men [10]. In the light of our results, gender composition does not seem to have the same kind of influence regarding the association between the psychosocial work environment and psychological distress. As the explanation to differences in prevalence of psychological distress between gender compositions does not seem to be found in the psychosocial work environment, more research is needed to explore other possible explanations. For the psychosocial work environment factors included in this study, only one factor (not important work) differed significantly in prevalence between workplace gender compositions. Previous research also indicates that workplaces with different gender composition do not differ significantly in the reported character of their psychosocial work environment [9]. These findings indicate that the explanation to differences in health connected to workplace gender composition might be found elsewhere. One
possible way forward could be to explore how workplace cultures regarding health behaviour fits into this picture. However, although the psychosocial work environment cannot explain the differences in psychological distress between the gender compositions, our study confirms that demand, control and support are all related to mental distress at all types of workplaces. Our study also adds the status variables such as important work and being looked down upon as factors that can be of interest to explore in future research.

The longitudinal design allows us to reflect on the development of psychological distress prevalence over time. The lowest prevalence of psychological distress at age 21 was found among men who at age 42 worked at mixed workplaces; but at age 42 the differences compared to men at workplaces with other gender compositions were no longer significant. These results suggest that there might be a positive health selection of men into the mixed workplaces, i.e. that the group of men who at age 42 worked at mixed workplaces started their working life with lower prevalence of psychological distress compared to men who ended up at workplaces with other gender compositions. We can also see that there might be a negative health selection of men into workplaces with more women. The lack of significant differences in psychological distress between gender compositions for men at age 42 is consistent with several previous studies on the occupational [12] and workplace level [7, 14]. However, the new finding of a potential positive health selection of men into the mixed workplaces and negative health selection of men into workplaces with more women requires more attention in future studies. The longitudinal design also indicates that the health differences between the gender compositions might evolve during working life (between ages 21 and 42). At workplaces with a mixed gender composition the prevalence of psychological distress increased considerably during working life for both women and men, but women start and end up at a higher prevalence compared to the men. This suggests that the conditions in working life might have a negative influence on mental health for both women and men at mixed workplaces, and that the differences that were present at an earlier age have been scaled up. It is possible that the work environment is similar for women and men at these workplaces and that initial differences in mental ill-health explain the differences at age 42. It is also possible that the workplaces are not really gender integrated, but that women and men have very different work situations with diverse associations with mental ill-health. The latter interpretation is to some extent supported in the descriptive analysis where more women than men at these workplaces reported low control. Also, previous analyses on the same population showed that a mixed gender composition often co-existed with gender inequalities in salaries, educational levels and parental leave at the workplace [38]. Regardless of the explanation to the differences in prevalence between women and men, the similar development of psychological distress over time for women and men in the same gender composition gives some support for the assumption that the gendered organizations are of importance for mental ill-health, and perhaps more so than gender roles attached to the individual, which was suggested previously [22, 23]. However, more research on larger samples is needed to clarify the importance of gender at different levels.
The conclusions have been changed to the following:

(page 13, paragraph 3)
In contrast to previous research this study suggests that employees at workplaces with a mixed gender composition might have a higher likelihood of psychological distress compared to workplaces with more men. This association cannot be explained by differences in the reaction to the psychosocial work environment, and thus the work environment hypothesis is not supported. Workplaces with a mixed gender composition needs further research attention to explain the negative development of psychological distress during working life for both women and men at these workplaces.