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An Exploratory Study of the Relations Between Women Miners' Gender-Based Workplace Issues and their Mental Health and Job Satisfaction

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Abstract

The current study investigated the extent to which gender-based workplace issues were associated with women miners' mental health and job satisfaction. Participants were 263 women miners from Australian and other international mines sites owned by an Australian-based mining company. They completed an online survey that contained measures of gender-based workplace issues, mental health, and job satisfaction. An exploratory factor analysis identified three higher-order factors: organizational sexism, interpersonal sexism, and sense of belonging. Both organizational and interpersonal sexism were positive independent predictors of mental health and job satisfaction. In addition, sense of belonging mediated the associations between organizational sexism and (a) mental health and (b) job satisfaction. Potential strategies for reducing organizational and interpersonal sexism and increasing women's sense of belonging are considered.

Keywords: gender inequity; job satisfaction; mental health; mining; sense of belonging; sexism

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A substantial body of research indicates the benefits of gender diversity in the workplace (e.g., Campbell & Mínguez-Vera, 2008; Herring, 2009; McMahon, 2010). However, many industries continue to be grossly overrepresented by one gender or the other. The present research focused on the mining industry as prime example of an industry that currently lacks gender diversity.

The Underrepresentation of Women in the Mining Industry

The mining industry contains a large underrepresentation of female employees. For example, governmental statistical surveys have found that in Canada only 19.4% of employees in the mining industry are women. In Australia, this figure is 16.4%, in the USA it is 13.3%, and in Japan it is 0% (Catalyst, 2015). The underrepresentation of women occurs in managerial, professional, technical, and trade roles, although it does not occur for office-based administration positions (Australian Women in Resources Alliance, 2012). This underrepresentation starts early in the workforce pipeline. For example, figures from Graduate Careers Australia show that women constitute only 18.2% of Bachelor of Mining Engineering graduates (Santic, 2013).

The underrepresentation of women in the mining workforce needs to be addressed for three reasons. First, it violates the principle of gender equity. Second, skills shortages are common in the mining industry, and increasing the number of women miners offers a solution to this issue. For example, the asset president of a large multinational mining company recently commented that “a workforce with people from diverse backgrounds, including a better gender balance, is critical to supplying the workforce of the future” (Rag Udd, BHP Billiton, as cited in Masige, 2016). Finally, women’s minority status in the mining industry places them at greater risk of poorer mental health and job satisfaction than their male colleagues due to their lower social status, less social support, and less social integration in the industry (Bergman & Hallberg, 2002; Penhaligon et al., 2013; Seeman, 1996; Skaalvik & Skaalvik, 2011; Thoits, 2011). The present study addressed the last of these three issues. Specifically, it aimed to understand which gender-based workplace issues are negatively related to women miner’s mental health and job satisfaction.

Previous Research

Previous research in this area has adopted a qualitative approach, consisting of in-depth interviews and participant observation with small groups ($Ns \sim 20$) of women miners. This approach has been successful in identifying a range of gender-based workplace issues that may impact negatively on women miners. In particular, qualitative interviews have found that women miners feel that they have fewer opportunities for promotion and training, less job security, greater difficulty balancing work and child care responsibilities, greater exposure to sexist comments and harassment, less support from co-workers, and less of a sense of belonging in the industry, and they feel judged by others as being less competent than their male colleagues (e.g., Bailey-Kruger, 2012; Centre for Social Responsibility in Mining, 2006; Eveline & Booth, 2002; Lucas & Steimel, 2009; Mayes & Pini, 2014; Murray & Peetz, 2009a, 2009b, 2010; Nowak, Marinelli, Lord, & Bonner, 2014; Pattenden, 1998; Rolston, 2010; Tallichet, 2000; Yount, 1991).

Critically, however, there has not yet been any *quantitative* research in this area. Quantitative research provides an important complement to the qualitative approach because it allows researchers to undertake more objective and empirically-based investigations across larger and more representative samples of women miners. Quantitative research also enables the use of inferential statistical tests that can (a) identify higher-order factors that encompass specific workplace issues (Bergman & Hallberg, 2002), (b) establish the relations between these higher-

order factors, and (c) investigate their association with key outcome variables. Finally, the quantitative approach allows researchers to statistically control for confounding variables that have the potential to obscure clear interpretations of the results (e.g., participants' age, number of years working in the industry).

The Current Study

The current study provided the first quantitative investigation of women miners' workplace issues. It surveyed 263 women miners from an Australian-based mining company. Participants indicated the extent to which they had been affected by a range of gender-based workplace issues that had been identified in previous qualitative research. Based on prior research (Bergman & Hallberg, 2002), we expected that responses to these workplace issues could be statistically aggregated into meaningful higher-order factors using an exploratory factor analysis.

The present research also investigated the extent to which women miners' gender-based workplace issues were related to two key outcome variables: job satisfaction and mental health. These two variables represent *specific* and *general* indicators of employees' well-being respectively. Job satisfaction is one of the most studied outcome variables in organisational research due to its centrality in job-related effectiveness and productivity. Mental health is a growing concern for occupational health and safety stakeholders (LaMontagne, Keegel, & Vallance, 2007). Job satisfaction and mental health are positively related to one another (for a meta-analysis, see Faragher, Cass, & Cooper, 2005), and they are both negative predictors of workplace turnover (Wright & Bonett, 2007). Hence, it is important to understand whether and in what way women miners' gender-based workplace issues relate to their job satisfaction and mental health.

An Exploratory Approach

To aid interpretation of the research results and to avoid giving the false impression of a confirmatory research approach, it is important to be clear that the present study was exploratory in nature (Wagenmakers, Wetzels, Borsboom, van der Maas, & Kievit, 2012). We did not have clear a priori hypotheses about which higher-order factors would emerge from our exploratory factor analysis of the gender-based workplace issues. Having said that, prior research can inform the sort of factors that might be expected. In particular, Bergman and Hallberg (2002) sampled women from an unspecified male-dominated industry and asked them to respond to a series of "workplace culture" items that were very similar to those used in the current study. Bergman and Hallberg's exploratory factor analysis identified four higher-order factors: perceived burdens on me (e.g., "I have to be more accomplished and pushy to be promoted"), perceived burdens on women (e.g., "women have fewer opportunities for professional development than men"), sexual harassment (e.g., "unwelcome connotations, glances, gestures, or comments at work"), and organizational support (e.g., "women receive organizational support to manage their professional work and their domestic responsibilities [double role]"). We expected similar sorts of factors to emerge in the current study.

Method

Participants

Participants were a convenience sample of employees from a mining company with operations in Australia, Africa, South America, and South East Asia. In 2015, the company employed around 6,000 full-time equivalent staff, of which 16% were women. The company was

relatively progressive regarding gender equality. For example, many of its senior staff were women, it had instigated flexible working arrangements for women, it had established a workforce diversity forum, and it regularly conducted diversity surveys. Neither the researchers nor the mining company had any conflict of interest in the conduct or reporting of the current research. In particular, the mining company did not fund the current research project.

Prospective participants were eligible to complete the survey if they were female, 18 years or older, an employee or contract worker for the mining company, and proficient in the English language. We collected data from a total of 297 participants. This represents a response rate of approximately 31%. Of the 297 participants, 20 withdrew from the survey part way through and did not respond to an informed consent item near the end of the survey. A further 14 participants completed the survey but actively declined their informed consent for their data to be analysed. The data from these 34 participants were deleted, leaving a total of 263 participants.

All participants reported being female in response to a question about their gender. Participants' age ranged from 21 to 63 years, with a mean age of 37.18 years ($SD = 8.86$). Just over half of the participants self-identified as White ($n = 142$; 53.99%), with the remainder indicating that they were Asian ($n = 56$; 21.29%), "other" ($n = 41$; 15.59%), African ($n = 17$; 6.46%), or Aboriginal ($n = 2$; 0.76%), and 5 participants declining to specify their ethnicity (1.90%).

Almost half of the participants were married ($n = 124$; 47.15%), with the remainder being in a stable relationship ($n = 69$; 26.24%), single ($n = 57$; 21.67%), in a casual relationship ($n = 9$; 3.42%), or declining to respond to this item ($n = 4$; 1.52%). Most participants were not responsible for caring for any children ($n = 158$; 60.08%).

The amount of time that participants indicated that they had worked in the mining industry ranged from less than a year to 35 years ($M = 7.52$, $SD = 5.77$). Just over half of the participants worked at Australian mine sites ($n = 139$, 52.85%), and the remainder worked at sites in Africa ($n = 16$, 6.08%), South America ($n = 42$, 15.97%), South East Asia ($n = 39$, 14.83%), other unspecified international locations ($n = 18$, 6.84%; total non-Australia-based participants = 115; 43.73%), or they declined to respond to this item ($n = 9$; 3.42%). Most participants occupied support/service roles ($n = 152$; 57.79%), with the remainder describing themselves as managerial ($n = 36$; 13.69%), operational ($n = 33$; 12.55%), "other" ($n = 33$; 12.55%), or declining to respond to this item ($n = 9$; 3.42%). Most participants indicated that they worked full-time ($n = 234$; 88.97%) and that they were ongoing employees ($n = 229$; 87.07%), with the remainder indicating that they worked part-time ($n = 26$; 9.89%) or declining to respond ($n = 3$; 1.14%), and that they were contract workers ($n = 31$; 11.79%).

The top part of Table 1 provides a breakdown of key demographic variables by worksite location. As can be seen in Table 1, participants from Australian mine sites were significantly older than those from non-Australian mine sites, more likely to be married, and less likely to work full-time.

Measures

Gender-based workplace issues. Participants responded to a list of 22 statements that referred to gender-based workplace issues for women miners, such as fewer opportunities for promotion and training, exposure to sexist comments, and support from co-workers. These issues were sourced from the qualitative literature in this area (Bailey-Kruger, 2012; Centre for Social Responsibility in Mining, 2006; Eveline & Booth, 2002; Lucas & Steimel, 2009; Mayes & Pini, 2014; Murray & Peetz, 2009a, 2009b, 2010; Nowak et al., 2014; Pattenden, 1998; Rolston, 2010;

Table 1
Demographic and Key Variables as a Function of Worksite Location

Variable	Worksite location		Comparison test results
	Australia	Other countries	
Age	39.19 (9.25)	34.74 (7.87)	$t(244) = 4.07, p < .001$
Years in industry	7.87 (5.96)	7.02 (5.61)	$t(248) = 1.15, p = .249$
Percentage caring for children	36.97%	38.26%	$\chi^2(247) = 0.21, p = .643$
Percentage full-time workers	82.73%	95.65%	$\chi^2(251) = 10.55, p = .001$
Percentage ongoing employees	84.17%	91.30%	$\chi^2(253) = 2.48, p = .115$
Percentage married	53.96%	40.87%	$\chi^2(253) = 4.06, p = .044$
Organizational sexism	3.96 (2.06)	4.62 (1.70)	$t(252) = -2.81, p = .005$
Interpersonal sexism	2.62 (1.92)	3.56 (2.02)	$t(252) = -3.79, p < .001$
Sense of belonging	7.39 (1.39)	7.06 (1.38)	$t(252) = 1.88, p = .061$
Mental health problems	6.53 (7.19)	9.90 (9.16)	$t(214) = -3.22, p = .001$
Job satisfaction	6.57 (1.53)	6.67 (1.45)	$t(252) = -.56, p = .578$

Note. Standard deviations are presented in parentheses.

Tallichet, 2000; Yount, 1991). The items were similar to those used by Bergman and Hallberg (2002). Example items include: “I have found it difficult to get along with my male co-workers because I am a woman,” and “I have had access to suitable facilities for women (e.g., toilets, shower blocks).” For each issue, we asked participants to report the extent to which they agreed or disagreed that the issue had applied to them in the last 12 months of working in the mining industry. Participants responded to these items using a 9-point scale anchored *totally disagree* (1) and *totally agree* (9). A list of the 22 items is provided in Table 2.

Mental health. Mental health was measured using the short form Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 2004). This scale consists of three 7-item subscales that assess depressive symptoms, anxiety, and stress. Example items are “I felt that life was meaningless” (depressive symptoms), “I felt scared without any good reason” (anxiety), and “I found it difficult to relax” (stress). Participants responded to these items with reference to their experiences over the past week using a 4-point scale anchored *never* (0) and *almost always* (3).

Job satisfaction. Job satisfaction was measured using the 4-item Index of Affective Job Satisfaction (Thompson & Phua, 2012). This scale has been validated using Australian samples, and it has good internal reliability and convergent validity with other established measures of job satisfaction (Thompson & Phua, 2012). The items were as follows: “I find real enjoyment in my job,” “I like my job better than the average person,” “most days I am enthusiastic about my job,” and “I feel fairly well satisfied with my job.” We also assessed the extent to which participants wanted to stay in the mining industry using the following two items: “I want to stay in the mining industry for as long as possible,” and “I often think about leaving the mining industry” (reverse scored; for a similar measure, see Van Dick et al., 2004). Participants responded to these six items in relation to their experience over the last 12 months using a 9-point scale anchored *totally disagree* (1) and *totally agree* (9).

Demographic measures. Participants also responded to items assessing their gender, age, ethnic background, relationship status, number of children that they were caring for, number of years that they had worked in the mining industry, location of their worksite, broad work role (e.g., support/service, operational, managerial), employment status (full-time, part-time), employment type (ongoing employee, contract worker), and degree of difficulty that they had understanding the survey. At the end of the survey, participants indicated their informed consent for their data to

be included in the analyses. A copy of the research survey is available at <http://bit.ly/womenminers>. A copy of the deidentified data set is available from the first author on request.

Procedure

This research had ethical clearance from the University of Newcastle, Australia. Human Research Ethics Committee (Approval number: H-2015-0446). Participants were recruited from worksites in Australia, Africa, South America, and South East Asia. Participants were contacted by email following an introduction and authorization from a general manager of the mining company's human resources unit. Only female employees were contacted. Mining company staff identified employees' gender based on the company's internal employee database. The recruitment email contained a hyperlink to the online survey. Three reminder emails were sent. It was made clear that participation was anonymous and voluntary, and that neither the researchers nor the employer would know who had completed the survey and who had not.

The survey was titled "women in the mining industry," and it was introduced as investigating "women's experiences of working in the mining industry and how these experiences affect their job satisfaction and mental health." The survey was only available in English. The median completion time was 17.09 minutes.

Participants responded to the gender-based workplace issues first, followed by the measures of job satisfaction and mental health. They then responded to the demographic items.

If participants missed a response to an item on a page of the online survey, then the survey software automatically reminded them to respond to that item, and it did not allow them to continue until they had done so. Hence, there was no missing data other than for some demographic variables for which participants were given the opportunity to decline a response.

Results

Exploratory Factor Analyses

Gender-based workplace issues. We performed an exploratory principal axis factor analysis on the 22 gender-based workplace issue items. Six factors had eigenvalues greater than or equal to 1.0. However, a scree test indicated that only two factors should be extracted. Given this discrepancy, we conducted a parallel analysis to provide a clearer assessment of the appropriate number of factors that were suitable for extraction (Horn, 1965). Specifically, we used Watkins' (2000) Monte Carlo simulation to conduct factor analyses on 100 random data sets, each comprising 22 variables and 263 participants. The first three factors in the real data set had eigenvalues that were larger than the first three factors from the simulated data sets (real eigenvalues: 7.09, 2.03, 1.52). Hence, we specified the extraction of three factors. Following Russell (2002, p. 1638), we used the Promax method of oblique rotation during factor extraction in order to allow the factors to correlate with one another. Table 2 shows the factor loadings of items that loaded greater than or equal to .50 on one of the three extracted factors in the pattern matrix.

As can be seen in Table 2, seven items loaded $\geq .50$ on the first factor, and none of these items loaded $> |.28|$ on either of the other two factors. These items related to negative work-based comparisons with male co-workers in terms of opportunities for promotion and career progression, job stability, training, pay, competence, work-life balance, and performance standards. This factor

Table 2

Factor Loadings of Gender-Based Workplace Issue Items

	<i>M</i>	<i>SD</i>	Factor		
			1	2	3
Eigenvalue			7.09	2.03	1.52
Percentage of Variance			32.20%	9.23%	6.90%
Organizational sexism					
I feel like I have received fewer opportunities for promotion and career progression than my male co-workers.	4.48	2.72	.89		
I have felt that I have had less job stability and security than my male co-workers.	3.47	2.43	.78		
I feel like I have received fewer on-the-job training opportunities than my male co-workers.	3.92	2.54	.75		
I have felt underpaid relative to my male co-workers.	5.10	2.64	.70		
I have felt that I have needed to prove my competence more than my male co-workers.	5.22	2.80	.54		
I have had a worse work-life balance than my male co-workers.	3.59	2.33	.53		
I have felt that I have been judged on higher performance standards than my male co-workers.	4.42	2.63	.50		
Interpersonal sexism					
I have seen inappropriate images of women in the workplace (e.g., pornography).	2.12	2.06		.68	
I have experienced sexual harassment (e.g., inappropriate comments or behaviour).	3.08	2.61		.66	
I have experienced sexist comments.	4.02	2.76		.63	
Sense of belonging					
I have felt like I belong in the mining industry.	6.89	1.92			.76
I have had positive experiences as a woman in the mining industry.	7.27	1.70			.64
I have received good support from my male co-workers.	7.32	1.72			.62
I have felt accepted by my male co-workers.	7.37	1.61			.57
Excluded items					
I have felt part of a low status minority group in the mining industry.	3.71	2.41			
I received less encouragement to enter the mining industry than men have.	3.80	2.47			
I have found it difficult to get along with my male co-workers because I am a woman.	2.66	1.97			
I have felt that I should reduce my femininity at work in order to fit in.	3.67	2.52			
I have had access to suitable facilities for women (e.g., toilets, shower blocks).	7.86	1.97			
I have felt that I fit the typical miner stereotype.	4.16	2.44			
I have felt that I don't belong to the "boy's club."	4.78	2.61			
I have been able to find a good balance between my work and other responsibilities (e.g., child care).	6.16	2.29			

Note. Participants responded to each item using a 9-point scale anchored *totally disagree* (1) and *totally agree* (9) with a *neutral* midpoint of 5. The cut-off criteria used for including factor loadings in the table is $\geq .50$. No items loaded $> .28$ on any other factor. The item about "positive experiences as a woman in the mining industry" was not included in the sense of belonging scale because it lacked face validity.

was similar to Bergman and Hallberg's (2002) perceived burdens on women factor. We labelled it *organizational sexism*. Three items loaded $\geq .50$ on the second factor and not $> |.16|$ on either

of the other two factors. These items related to inappropriate images of women in the workplace and experiences of sexual harassment and sexist comments. This factor was similar to Bergman and Hallberg's (2002) sexual harassment factor. Here, we labelled it *interpersonal sexism*. Finally, four items loaded $\geq .50$ on the third factor and not $> .19$ on either of the other two factors. These items related to feelings of belonging, positive experiences in the industry, and perceived support and acceptance from male co-workers. This factor was somewhat similar to Bergman and Hallberg's (2002) organizational support factor, although it was broader than this factor because it referred to support from co-workers and it had a greater emphasis on belonging than support. We labelled it *sense of belonging*.

Mean scores were created for the items associated with each of the three factors. In the case of sense of belonging, the item referring to positive experiences in the industry was omitted from the aggregate index for this construct because it lacked face validity. Descriptive statistics and Cronbach alphas for the resulting scales can be found in Table 3.

Eight gender-based workplace issue items did not load highly ($\geq .50$) on any of the three extracted factors. These single-item measures are listed at the bottom of Table 2 as "Excluded items."

Mental health. We performed a principal axis factor analysis on the 21 mental health items. A scree plot showed a clear single factor solution. All items loaded $\geq .49$ on this factor. Consequently, following Henry and Crawford (2005), we summed scores to compute an overall DASS score that provided a general measure of mental health. Scores could range from 0 to 61, with higher scores indicating poorer mental health. Hence, this measure provided an index of *mental health problems*.

Job satisfaction. We performed a principal axis factor analysis on the four job satisfaction items and the two intention to stay in the industry items. One factor had an eigenvalue greater than 1.0, and both a scree test and parallel analysis clearly indicated a single factor solution. All six items loaded $\geq .50$ on this factor, including the two items measuring intention to stay in the industry (.55 & .52). Consequently, we computed a measure of job satisfaction based on the mean of these six items.

Mean Values

Table 3 provides the means, standard deviations, minimum and maximum values, and Cronbach alpha values for the key variables. Looking at the means in Table 3, it is important to note that participants' mean score in relation to organizational sexism experienced in the past 12 months was closest to the "very slightly disagree" response option ($M = 4.31$; the scale ranged from 1 to 9 with a "neutral" midpoint of 5). Mean scores also represented the "tend to disagree" option with regards to experiences of interpersonal sexism ($M = 3.07$) and the "tend to agree" option with regards to a sense of belonging in the industry ($M = 7.21$) and job satisfaction over the past 12 months ($M = 6.58$). Furthermore, participants scored lower on the measure of mental health problems ($M = 8.09$) than a sample of the general population in the UK ($M = 9.43$; Henry & Crawford, 2005). Hence, in general, the women in our sample tended to report low levels of organization and interpersonal sexism and high levels of sense of belonging, mental health, and job satisfaction.

Table 3

Descriptive Statistics and Zero-Order Correlation Coefficients

Measure	<i>M</i>	<i>SD</i>	Min	Max	<i>A</i>	1	2	3	4	5
1. Organizational sexism	4.31	1.92	1.00	8.86	.87	-				
2. Interpersonal sexism	3.07	2.03	1.00	8.67	.75	.49**	-			
3. Sense of belonging	7.20	1.41	2.00	9.00	.72	.36**	-.27**	-		
4. Mental health problems	8.09	8.31	0.00	52.00	.93	.33**	.32**	.33**	-	
5. Job satisfaction	6.58	1.51	1.60	9.00	.85	.30**	-.27**	.49**	.31**	-
6. Age	37.18	8.86	21.00	63.00	-	-.13*	-.18**	.11	-.16*	.15*
7. Years in industry	7.52	5.77	0.00	35.00	-	.02	.06	.11	.07	.07

Note. $N = 263$ for all correlations. All scales have a theoretical range from 1 to 9 apart from mental health problems, which has a theoretical range of 0 to 61.

* $p < .05$ ** $p < .001$.

Demographic Differences

Table 3 shows the zero-order correlations between participants' age and number of years working in the industry and our other key variables. These correlations show that older women reported lower levels of organizational and interpersonal sexism and mental health problems and higher levels of job satisfaction. Notably, number of years in the industry did not have any significant associations with these variables. Hence, there did not appear to be any cumulative effect of duration in the mining industry.

The bottom part of Table 1 compares the key variables as a function of worksite location. There were significant differences between participants who worked at Australian mine sites and those who worked at mine sites in other countries (Africa, South America, and South East Asia). In particular, women who worked at Australian mine sites reported significantly less organizational and interpersonal sexism and significantly fewer mental health problems. There were no significant location differences with regards to sense of belonging or job satisfaction.

As noted earlier, most participants occupied support/service roles ($n = 152$; 57.79%), with the remainder describing themselves as managerial ($n = 36$; 13.69%), operational ($n = 33$; 12.55%), "other" ($n = 33$; 12.55%), or declining to respond to this item ($n = 9$; 3.42%). It is possible that the women in these support/service roles experienced fewer work-related problems than those in managerial, operational, or other roles because the support/service role is less dominated by men and more traditionally occupied by women. If this is the case, then women in support/service roles should be the most likely to disagree with the item "I have felt that I should reduce my femininity at work in order to fit in," which was one of the gender-specific workplace issue items that did not load highly on any of the three factors that we identified in our factor analysis. Contrary to this prediction, a one-way ANOVA found no significant work role differences in relation to this femininity item, $F(3, 250) = .76$, $p = .520$. In addition, a one-way ANOVA found no significant work role differences in either organizational or interpersonal sexism, sense of belonging, mental health, or job satisfaction, $ps \geq .137$ (see Table 4). Hence, although the majority of our participants

worked in a role that may have been more traditionally female, our analyses found no work role differences to suggest that this was an influential factor. Despite these null findings, we controlled for work role as a covariate in our sensitivity analyses (see below).

Table 4
Key Variables as a Function of Work Role

Variable	Work Role				One-way ANOVA results
	Support/ Services	Operational	Managerial	Other	
<i>N</i>	152	33	36	33	254
Organizational sexism	4.23 (1.80)	4.63 (1.91)	4.04 (2.13)	4.40 (2.32)	$F(250) = 0.61, p = .608$
Interpersonal sexism	2.95 (1.89)	3.52 (2.21)	2.79 (2.08)	3.48 (2.32)	$F(250) = 1.42, p = .238$
Sense of belonging	7.22 (1.41)	7.14 (1.30)	6.94 (1.48)	7.70 (1.16)	$F(250) = 1.86, p = .137$
Mental health problems	8.09 (8.38)	6.79 (6.18)	7.67 (7.99)	9.06 (9.04)	$F(250) = 0.45, p = .715$
Job satisfaction	6.63 (1.53)	6.51 (1.63)	6.35 (1.24)	6.95 (1.39)	$F(250) = 1.01, p = .391$

Note. Standard deviations are presented in parentheses.

Zero-Order Correlations

Table 3's zero-order correlation coefficients show that both organizational and interpersonal sexism were negatively related to sense of belonging and job satisfaction and positively related to mental health problems. The more women miners experienced organizational and interpersonal sexism in their workplace over the past year, the less they felt a sense of belonging in the industry over the past year, the more mental health problems they reported experiencing over the past week, and the less satisfied they were with their job over the past year (average absolute r for these relations = .31). Sense of belonging was also negatively related to mental health problems and positively related to job satisfaction. The greater women's sense of belonging in the industry, the fewer mental health problems they experienced and the greater their job satisfaction (average absolute r for these relations = .41).

Multiple Regression Tests

As can be seen from Table 3, organizational sexism was strongly and positively related to interpersonal sexism ($r = .49, p < .001$). Consequently, the association between organizational sexism and other variables could be due to its shared variance with interpersonal sexism, and the association between interpersonal sexism and other variables could be due to its shared variance with organizational sexism. In order to isolate the unique associations of each of these two predictor variables, we entered them as simultaneous predictors in a series of multiple regression analyses in which the outcome variable was either sense of belonging, mental health problems, or job satisfaction. The results of these regression tests are presented in Table 5.

When sense of belonging was the outcome variable, only organizational sexism emerged as a significant predictor. The relation between interpersonal sexism and sense of belonging when controlling for organizational sexism was nonsignificant. Hence, the previously observed zero-order correlation between interpersonal sexism and sense of belonging ($r = -.27$) appears to be due to the variance that interpersonal sexism shares with organizational sexism. In contrast, both organizational and interpersonal sexism showed unique and independent associations with mental health problems and job satisfaction.

Table 5
Multiple Regression Tests

Outcome	Predictor	β	95% CIs	t	p
Sense of belonging	Organizational sexism	-0.30	-0.31, -0.12	-4.53	< .001
	Interpersonal sexism	-0.12	-0.17, 0.01	-1.84	.066
Mental health problems	Organizational sexism	0.23	0.41, 1.53	3.42	.001
	Interpersonal sexism	0.21	0.34, 1.40	3.23	.001
Job satisfaction	Organizational sexism	-0.22	-0.28, -0.07	3.23	.001
	Interpersonal sexism	-0.16	-0.22, -0.02	2.87	.004

Note. All beta values are standardized coefficients. 95% CIs = the upper and lower 95% confidence intervals. The df for all tests is 260.

Mediation Models

Prior work has found that sense of belonging is a positive predictor of both mental health (e.g., Hagerty, Williams, Coyne, & Early, 1996; Rubin & Kelly, 2015; Stebleton, Soria, & Huesman, 2014) and job satisfaction (e.g., Van Dick et al., 2004; Van Dick, van Knippenberg, Kerschreiter, Hertel, & Wieseke, 2008; Winter-Collins & McDaniel, 2000). Furthermore, prior research has found that sense of belonging mediates the associations between teacher's relations with their colleagues and their (a) emotional exhaustion and (b) job satisfaction (Skaalvik & Skaalvik, 2011). In addition, perceived social rejection has been found to mediate the relation between workgroup mistreatment and depression (Penhaligon, Louis, & Restubog, 2013). Based on this prior research, we investigated sense of belonging as a potential mediator of the associations between gender-based workplace issues and mental health and job satisfaction.

The multiple regression results that are reported above indicate that interpersonal sexism was not significantly related to sense of belonging when controlling for organizational sexism ($p = .066$), and our subsequent analyses found that sense of belonging did not mediate the effects of interpersonal sexism on either mental health or job satisfaction when controlling for organizational sexism ($ps > .05$). Hence, for the sake of brevity, we focus on the mediating effect of sense of belonging in the associations between organizational sexism and (a) mental health and (b) job satisfaction.

We used Hayes' (2013) PROCESS software to test our mediation models. This software uses a path analytical framework and bootstrapping to provide powerful estimates of indirect effects. We used 1,000 bootstrapping iterations to obtain bias-corrected bootstrapped 95% confidence intervals for indirect effects. We tested two mediation models in which organizational sexism was the predictor variable, sense of belonging was the mediator variable, and either mental health problems (Model 1) or job satisfaction (Model 2) were the outcome variables. The results for these two models are provided in Table 6.

The first model investigated whether organizational sexism predicted mental health problems via sense of belonging. Again, in order to investigate associations with organizational sexism over and above any shared variance with interpersonal sexism, we controlled for interpersonal sexism in this mediation test. Specifically, we included interpersonal sexism as a covariate when estimating the paths from organizational sexism to sense of belonging and mental health problems. As can be seen in Model 1 of Table 6, there was a significant positive total effect of organizational sexism on mental health problems. This total effect indicated that, consistent with the correlation analyses, greater organizational sexism was associated with more mental health problems. There was also a significant positive direct effect of organizational sexism on

mental health problems when controlling for sense of belonging. However, the direct effect was smaller ($b = 0.69$) than the total effect ($b = 0.97$), indicating that controlling for sense of belonging led to a reduction in the size of the association between organizational sexism and mental health. The test of the indirect effect established whether this reduction in effect size was itself significant. The 95% confidence intervals for this indirect effect were both positive, indicating a significant difference between the size of the total and direct effects at the $p < .05$ level. In other words, the relation between perceived organizational sexism over the past year and mental health problems over the past week was partially accounted for by variability in women's sense of belonging over the past year.

The second model investigated whether organizational sexism predicted job satisfaction via sense of belonging while controlling for interpersonal sexism. As can be seen in Model 2 of Table 6, there was a significant negative total effect of organizational sexism on job satisfaction and a smaller nonsignificant negative direct effect of organizational sexism on job satisfaction when controlling for sense of belonging. The indirect effect was significant, indicating a significant mediating effect via the sense of belonging.

Table 6

Mediation Tests in which Organizational Sexism is the Predictor and Sense of Belonging is the Mediator

Model	Effect type	Variables	b (SE)	95% CIs	t	p
Model 1	Total effect	OS $\rightarrow$ MHP	0.97 (.28)	0.41, 1.53	3.42	< .001
	Direct effect	OS $\rightarrow$ MHP (controlling for SoB)	0.69 (.29)	0.12, 1.26	2.38	.018
	Indirect effect	OS $\rightarrow$ SoB $\rightarrow$ MHP	0.28 (.12)	0.10, 0.60	-	-
Model 2	Total effect	OS $\rightarrow$ JS	-0.17 (.05)	-0.28, -0.07	-1.46	.001
	Direct effect	OS $\rightarrow$ JS (controlling for SoB)	-0.07 (.05)	-0.17, 0.03	-1.46	.145
	Indirect effect	OS $\rightarrow$ SoB $\rightarrow$ JS	-0.10 (.033)	-0.18, -0.04	-	-

Note. OS = organizational sexism. SoB = sense of belonging. MHP = mental health problems. JS = job satisfaction. All beta values are unstandardized coefficients. SE = standard errors. 95% CIs = the upper and lower 95% confidence intervals. SEs and CIs for indirect effects are bootstrapped. If CIs are both positive or negative, then the indirect effect is significant at $p < .05$. All tests include interpersonal sexism as a covariate. The df for all tests is 260.

Sensitivity Analyses

The analyses that are reported in Tables 5 and 6 were reconducted (a) including covariates and (b) Winsorizing outliers. In general, the pattern of significant and nonsignificant results replicated when the analyses were conducted simultaneously controlling for all of the following variables: participants' age, number of years working in the industry, worksite location (Australian vs. overseas), and the extent to which participants indicated that they had problems understanding parts of the survey. The only slight difference was that, in Table 5, Model 1's direct effect became nonsignificant ($p = .095$; original $p = .018$). However, this change does not affect the conclusion that sense of belonging mediated the effect of organizational sexism on mental health. Table 5 and 6's significant and nonsignificant results also replicated after Winsorizing outliers, which were defined as being in the top or bottom 1% of the sample for each variable.

Discussion

Identifying Higher-Order Factors of Gender-Based Workplace Issues for Women Miners

Prior qualitative research has identified a series of gender-based workplace issues for women miners (Bailey-Kruger, 2012; Centre for Social Responsibility in Mining, 2006; Eveline & Booth, 2002; Lucas & Steimel, 2009; Mayes & Pini, 2014; Murray & Peetz, 2009a, 2009b, 2010; Nowak et al., 2014; Pattenden, 1998; Rolston, 2010; Tallichet, 2000; Yount, 1991).

However, no *quantitative* research has investigated the empirical commonalities between these issues. In a survey of 263 women miners, the present study found that the gender-based workplace issues that have been identified in previously qualitative research were subsumed by three higher-order factors: organizational sexism, interpersonal sexism, and sense of belonging.

Organizational sexism is similar to the construct of *workplace barriers to job progression* that was identified by Bailey-Kruger (2012) in her investigation of women miners, and it is consistent with various aspects of organizational sexism that have been identified in other prior qualitative research on women miners (Mayes & Pini, 2014; Murray & Peetz, 2009a; Nowak et al., 2014; Pattenden, 1998; Tallichet, 2000). The organizational sexism construct also converges with the *perceived burdens on women* factor identified by Bergman and Hallberg (2002) in their study of women in another male-dominated industry. Interpersonal sexism against women miners has also been noted in several past studies of women miners (Bailey-Kruger, 2012; Centre for Social Responsibility in Mining, 2006; Eveline & Booth, 2002; Murray & Peetz, 2009b; Pattenden, 1998; Tallichet, 2000) and women in another male-dominated industry (Bergman & Hallberg, 2002). Finally, various aspects of a sense of belonging have been identified in prior qualitative research on women miners (Bailey-Kruger, 2012; Murray & Peetz, 2009a, 2009b, 2010; Pattenden, 1998). The current study contributes to this prior work by highlighting these three gender-based workplace issues as higher-order factors that have a clear empirical basis across a large sample of international women miners.

Demographic Differences

The present research found several interesting associations with demographic variables. Older women reported lower levels of organizational and interpersonal sexism and mental health problems and higher levels of job satisfaction. Number of years in the industry had no significant associations with any of these variables. Hence, these age differences did not appear to be due to greater experience in the industry. Instead, they may reflect more general tendencies for (a) younger women to be the victims of sexual harassment (Lott, Asquith, & Doyon, 2001), and (b) job satisfaction to increase as a function of age (Ng & Feldman, 2010).

There were also differences as a function of worksite location: Women who worked at Australian mine sites reported significantly less organizational and interpersonal sexism and fewer mental health problems than women who worked at African, South American, and South East Asian worksites. These differences may reflect cross-cultural differences, with Australia's more progressive Western culture prescribing less sexism and better mental health practices in the workplace.

Predictors of Mental Health and Job Satisfaction

The current study also contributes to the literature in this area by identifying empirical relations between gender-specific workplace issues and the key outcomes of mental health and job satisfaction. Mean values indicated that the women that we sampled reported relatively low levels of organizational and interpersonal sexism and relatively high levels of sense of belonging, mental health, and job satisfaction. This pattern of results may reflect the effect of progressive workplace strategies that had been put in place by the specific mining company from which we sampled participants (e.g., flexible working arrangements, the establishment of a workforce diversity forum). Nonetheless, there was a notable degree of between-subject variance in responses on these variables, and several significant associations occurred between these variables. In particular, multiple regression analyses that controlled for other key variables and that

Winsorized outliers found that (a) both organizational and interpersonal sexism were positive independent predictors of mental health problems and job satisfaction, (b) organisational sexism, but not interpersonal sexism, was a negative predictor of sense of belonging, and (c) sense of belonging mediated the associations between organizational sexism and (i) mental health problems and (ii) job satisfaction. These results indicate that organizational and interpersonal sexism are independently associated with poorer mental health and job satisfaction, and that organizational sexism is negatively associated with poorer mental health and job satisfaction partly because of its negative association with sense of belonging. These findings extend prior work in this area in three ways.

First, the current findings provide the first quantitative empirical evidence of an association between sexism (organizational and interpersonal) and mental health (depression, anxiety, and stress) and job satisfaction *among women miners*. Prior qualitative research has alluded to these associations among women miners (e.g., Yount, 1991). However, the present results provide the first empirical corroborations of these links.

Second, the present research is the first to demonstrate a mediating effect of sense of belonging in the context of *gender relations in any industry or workplace*. The impact of organizational and interpersonal sexism on workers' mental health and job satisfaction has been established previously (e.g., Bergman and Hallberg, 2002; Bond, Punnett, Pyle, Cazeca, & Cooperman, 2004; Schneider, Swan, & Fitzgerald, 1997; Street, Gradus, Stafford, & Kelly, 2007). In addition, prior research has found that sense of belonging is (a) a positive predictor of job satisfaction (e.g., Van Dick et al., 2004; Van Dick et al., 2008; Winter-Collins & McDaniel, 2000) and (b) a mediator of the associations between interpersonal relations in the workplace and job satisfaction (Skaalvik & Skaalvik, 2011). However, to our knowledge, no prior research has identified sense of belonging as a mediator variable in the context of *gender relations in the workplace*. Hence, the present research makes a significant contribution by demonstrating that organizational sexism is related to poorer mental health and job satisfaction via a lowered sense of belonging among women. In other words, organizational sexism may adversely affect women's mental health and job satisfaction by lowering their sense of belonging in the industry. To our knowledge, this is the first demonstration of this mediation effect in *any industry or workplace*.

Third, the present findings highlight the importance of distinguishing between organizational and interpersonal sexism in subsequent research in this area. This distinction was apparent in the present research vis-à-vis (a) the emergence of two factors in the exploratory factor analysis, and (b) only organisational sexism uniquely predicting sense of belonging. It appears that although both types of sexism are related to mental health problems and job satisfaction, only organisational sexism is related to feelings of workplace belonging. This may be because organisational sexism and sense of belonging are both group-level variables that refer to the organization and industry, whereas interpersonal sexism is a more interpersonal variable.

Limitations

The current study suffered from a number of methodological limitations. First, our research survey was written in English, and we specified that participants needed to be proficient in the English language in order to take part in the research. This approach may have biased our samples from the African, South American, and South East Asian mine sites. Future research that recruits participants from countries in which English is not the first language should translate the research survey into native-speakers' first language in order to avoid this problem.

Second, the majority of women that we sampled (57.79%) occupied support/service roles that were potentially more traditionally female roles. Consequently, although all of our participants worked in a male-dominated industry, a proportion of them may have worked in more traditionally female roles. Theoretically, this sampling problem opens up the possibility that our results do not generalise to women who work in more male-dominated roles. However, three lines of evidence mitigate against this possibility. First, women in support/services roles did not differ significantly from women in other roles in terms of the extent to which they believed that they needed to reduce their femininity in order to fit in. Hence, the support/services roles did not appear to be more female-compatible than the other roles. Second, work role did not significantly influence any of our key variables (organizational sexism, interpersonal sexism, sense of belonging, mental health problems, job satisfaction). Third, our key results replicated when work role was included as a covariate in our analyses. Consequently, our results appeared to generalize from women in support/service roles to women in managerial and operational roles. Nonetheless, future research in this area should aim to sample women who work not only in male-dominated industries but also in traditionally male work roles.

A third limitation is that our sample was drawn from a single mining company. Furthermore, the particular company that we investigated was relatively progressive with regards to its treatment of female employees. Consequently, it is unclear to what extent our findings generalise to other mining companies, especially ones that have a less progressive attitude towards their female employees. It is possible that the progressive workplace strategies of the current mining company reduced the size of the associations that we observed by reducing variability in organisational and interpersonal sexism within our sample. In this case, the associations that in the current study may actually be *stronger* in less progressive mining companies where there is greater variability in women's experiences of organizational and interpersonal sexism. Further research with different mining companies is required in order to investigate this possibility.

A fourth, more general limitation is that our research was exploratory in nature, rather than confirmatory. Compared with confirmatory (pre-registered) research, exploratory research is more susceptible to Type I errors that result from less constrained multiple testing. Consistent with best practice, we have been transparent about our data-contingent analytical decisions, and we have provided a sensitivity analysis. Despite these safeguards, our research findings must be regarded as tentative in nature, and they require replication in other contexts.

Finally, our study's cross-sectional correlational design prevents clear conclusions regarding the causal direction of the associations between the variables that we studied. The following discussion of implications and applications makes the reasonable assumption that differences in organizational and interpersonal sexism cause differences in sense of belonging, mental health, and/or job satisfaction. However, we do not recommend that any of the suggested interventions be implemented until these causal claims are verified in future research.

Implications and Applications

The current study identified three factors that are related to women miners' mental health and job satisfaction, and interventions to improve mental health and job satisfaction may wish to focus on these factors. The first factor related to structural inequalities in the organisation that are connected with opportunities for promotion and career progression, job stability, training, pay, competence, work-life balance, and performance standards (i.e., organizational sexism). Women miners who felt relatively disadvantaged on these dimensions reported poorer mental health and job satisfaction. Hence, a potential strategy to improve women miners' mental health and job

satisfaction may be to reduce their perceived and actual disadvantage on these dimensions. This might be achieved through a combination of structural changes in the workplace (e.g., more opportunities for women miners' career progression) and/or greater transparency in the gender-based similarities on these dimensions (e.g., publication of workforce statistics demonstrating equality of pay).

The second factor that impinged on women's mental health and job satisfaction was interpersonal sexism, which manifested as experiences of inappropriate images of women in the workplace, sexual harassment, and sexist comments. Interpersonal sexism is more ingrained in wider intergender relations in society than organizational sexism (Yount, 1991), and addressing interpersonal sexism effectively is likely to require a partnership between employers and (male and female) employees.

The third factor that was associated with mental health and job satisfaction was sense of belonging in the industry, and this variable mediated the effects of organizational sexism on job satisfaction. Hence, an additional approach towards improving women miners' job satisfaction may be to increase their sense of belonging. An increased sense of belonging may be achieved by promoting community events *both* within the female group of miners (i.e., as a group of "women miners;" see also Bailey-Kruger, 2012) *and* within the industry as whole (i.e., women identifying as "miners").

Finally, it should be acknowledged that organisational and interpersonal sexism were clearly related to one another ($r = .49$). Again, the causal direction of this association could not be established in the current study. However, it is possible that reductions in organizational sexism may lead to corresponding reductions in interpersonal sexism among employees (Yount, 1991). This final point illustrates that organisational processes that affect organizational sexism should not be detached from broader social psychological processes that affect interpersonal sexism, and it highlights the need to consider comprehensive and integrated approaches to gender equality in the workplace rather than piecemeal approaches that focus on single issues.

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Conflict of Interest

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