

RESEARCH ARTICLE

Perceived Unfairness at Work, Social and Personal Resources, and Resting Blood Pressure

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Abstract

By drawing from theoretical perspectives suggesting that unfair conditions threaten fundamental psychological needs, perceived unfairness at work was proposed and tested as a predictor of resting blood pressure. As part of the Midlife Development in the United States Biomarkers project, participants completed questionnaires measuring perceived unfairness, self-esteem and coworker support. Resting blood pressure readings were also recorded as part of a larger physical examination. Results indicate that perceived unfairness at work was associated with higher resting diastolic and systolic blood pressure. Perceived unfairness was most strongly related to diastolic and systolic blood pressure among women with low levels of coworker support. Contrary to predictions, self-esteem did not moderate the association between perceived unfairness and blood pressure. These results suggest that high blood pressure may be a mechanism linking unfairness to negative health outcomes and point to coworker support as a moderator of the perceived unfairness–blood pressure relationship among women. Further research is needed exploring the mediating mechanisms linking unfair treatment at work to blood pressure and health. Copyright © 2013 John Wiley & Sons, Ltd.

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Keywords

fairness; health; blood pressure; coworker support

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Introduction

There is growing evidence that perceived unfairness is a factor in the physical health of workers. Longitudinal studies have empirically linked unfair treatment to myocardial infarctions, definite angina, cardiovascular deaths and other milder physical symptoms (Elovainio, Leino-Arjas, Vahtera, & Kivimaki, 2006; Robbins, Ford, & Tetrick, 2012). One pathway through which unfair treatment may influence health is high blood pressure, which is known to predict death from cardiovascular causes (e.g. Segal et al., 2005). In this present analysis, it is proposed that unfair treatment threatens fundamental needs for fairness and social self-preservation, leading to a main effect on resting blood pressure. It is also proposed that because unfair treatment poses a threat to one's self-worth, self-esteem and coworker support moderate the effect of unfair treatment on blood pressure, resulting in less positive associations between unfairness and blood pressure among individuals with high levels of self-esteem and coworker support. Thus, perceived unfairness is proposed here as a unique stressor that threatens fundamental psychological needs and results in elevated resting blood

pressure, particularly among individuals lacking personal and social resources.

Chronic stressors and blood pressure

Before delving into the potential association between unfair treatment and blood pressure, it is worth reviewing the general rationale for the link between chronic workplace stressors and resting blood pressure. Blood pressure refers to the pressure that is exerted on blood vessel walls and is typically measured in two components, diastolic and systolic blood pressure. Diastolic blood pressure is the minimum pressure exerted between pulse waves, whereas systolic pressure is the pressure exerted at the peak of the pulse wave and reflects the maximum pressure throughout the pulse wave cycle. Exposure to threatening or challenging situations provokes the rapid release of catecholamines, epinephrine and norepinephrine in particular, from the adrenal medulla and the vasculature, which in turn leads to increases in heart rate and blood pressure. Challenging and threatening tasks have been shown to increase heart rate and cardiac output, while threatening tasks have also been found to evoke increases in vascular resistance

(Blascovich, 2008), all of which contribute to blood pressure increases.

The transactional stress model (Lazarus & Folkman, 1984) provides a theoretical framework for explaining the effect of psychosocial stressors on blood pressure and other physiological changes in the body. According to the transactional stress model, when individuals encounter self-relevant stimuli, those stimuli are categorized as to whether they threaten goal-related progress, often automatically (Lazarus, 1991). When stimuli are perceived as threatening, affective stress reactions such as anxiety, depression or anger ensue. These emotions are accompanied by physiological changes, some of which involve the sympathetic nervous system (SNS). The effects of challenging conditions on acute increases in blood pressure may explain at least in part the observed increases in ambulatory blood pressure among workers in demanding jobs while at work (e.g. Schnall, Schwartz, Landsbergis, Warren, & Pickering, 1992). When exposure to stressful conditions is acute and finite in its duration, blood pressure is expected to return to neutral or baseline homeostatic levels after the stressful conditions have been removed. However, chronic stressors that are indefinite in duration may lead to lasting changes in homeostatic set points, resulting in elevated resting or baseline blood pressure. According to Ganzel and Morris's (2011; Ganzel, Morris, & Wethington, 2010) modulated allostasis model, chronic exposure to stressors results in emotional accommodations, or changes in emotional set points, that facilitate chronic readiness for future stressors, leading to chronically altered affective states and perceived stress. These emotional accommodations or set points remain across time and may be readjusted upward or downward as chronic stressor levels change. The emotional accommodations are in turn associated with SNS activity, which also alters its set points, changing baseline physiological arousal and affecting resting or baseline blood pressure levels (Ganzel & Morris, 2011; Ganzel et al., 2010).

The aforementioned rationale provides a theoretical basis for a causal link between chronic psychosocial stressors and resting or baseline blood pressure levels. Perceived fairness represents a unique type of chronic stressor that may influence blood pressure through the transactional stress process, posing threats and challenges to one's psychological needs and in turn stimulating SNS activity.

Workplace unfairness and blood pressure: Theoretical considerations

By drawing from conceptualizations of distributive justice (Leventhal, 1976) and interactional justice (Bies, 1987), unfair treatment in this study refers specifically to the unfair assignment of working conditions and tasks and disrespectful interpersonal treatment. Research indicates that unfair treatment does indeed threaten basic need fulfilment, suggesting need

deprivation may be a theoretical basis for physiological reactions to unfairness (Goldman, Slaughter, Schmit, Wiley, & Brooks, 2008). Studies have also shown that individuals are motivated to act in order to restore justice when they observe unfair acts toward themselves or others, presumably because they are seen as immoral (e.g. Cropanzano, Goldman, & Folger, 2003; Skarlicki & Kulik, 2005). Unfairness is associated with high-arousal emotions such as anger that prime or facilitate active behavioural responses. When unfairness threatens basic psychological needs and elicits behavioural and physiological responses, this may come at a cost to one's health. Results from a variety of samples have supported this notion, finding unfairness to be associated with psychological and physical strain (e.g. Elovainio, Kivimaki, & Helkama, 2001; Elovainio, Kivimaki, & Vahtera, 2002; Elovainio et al., 2006; Kivimaki et al., 2005). Empirical studies also suggest that perceived racial discrimination in life generally predicts blood pressure and cardiovascular reactivity (Din-Dzietham, Nembhard, Collins, & Davis, 2004; James, Lovato, & Khoo, 1994; Gyll, Matthews, & Bromberger, 2001), providing further evidence that unfair treatment at work may have a direct effect on health, and blood pressure in particular.

Unfair treatment also threatens one's social self, facilitating a need to protect and maintain one's integrity. The threat to one's social self has been proposed in the past as an explanation for effects of fairness on work attitudes and counterproductive behaviour (Ferris, Spence, Brown, & Heller, 2012; Goldman et al., 2008). Threats to the social self would be expected to evoke SNS activity and increase blood pressure by creating a need to respond and protect oneself. Unfair treatment has been shown to result in lower levels of self-esteem (e.g. De Cremer, van Knippenberg, van Knippenberg, Mullenders, & Stinglhamber, 2005), suggesting that being treated unfairly does indeed threaten one's social self. Dickerson, Gruenewald, and Kemeny's (2004) social self-preservation model proposes that threats to one's social self lead to a set of physiological responses that include increased SNS activity (Gruenewald, Kemeny, Aziz, & Fahey, 2004). Individuals have a strong desire to validate themselves (Crocker & Park, 2004), and it is expected that by threatening self-esteem, unfair treatment arouses physiological systems such as the SNS that facilitate a readiness to respond. To the extent that social self-preservation is a motive for responding to unfair treatment, it may lead to higher resting blood pressure levels for individuals in chronically unfair conditions, providing an additional basis for a main effect of unfairness on blood pressure. This hypothesis is consistent with Semmer and colleagues' (Semmer, Jacobshagen, Meier, & Elfering, 2007) stress as 'offense-to-self' perspective, which highlights the importance of fairness and legitimacy in stress reactions to work situations that offend or threaten one's sense of self.

Hypothesis 1: Perceived unfairness at work is positively associated with resting blood pressure.

The need for social self-preservation also points to two potential moderators of the fairness–blood pressure relationship: dispositional self-esteem and social support. Firstly, a strong self-esteem might protect against the effects of unfair treatment on blood pressure. Individuals with high levels of self-esteem have been found to have a more self-serving attributional styles, meaning that they tend to attribute positive outcomes to internal causal factors while attributing negative outcomes to external factors (Tennen & Herzberger, 1987), suggesting that individuals with high self-esteem would feel less threatened psychologically by unfair conditions. Global attributional styles, or dispositional tendencies to take blame or credit for outcomes, have been found to be associated with hypertension in some cases (Friedman et al., 2001). Individuals with low self-esteem also tend to depend more on others for validation (Janssen, Schaufeli, & Houkes, 1999) and are more reactive to negative events (Campbell, Chew, & Scratchley, 1991). There may therefore be an interaction between dispositional self-esteem and unfair treatment. Individuals with robustly high self-esteem may feel less threatened by unfair treatment, thus protecting against the effects of unfair treatment on blood pressure. In contrast, workers with low self-esteem may be more likely to perceive threats to their social selves when treated unfairly, increasing effort mobilization and blood pressure in response to unfairness.

Hypothesis 2: Self-esteem moderates (decreases) the association between perceived unfairness and resting blood pressure.

Coworker social support is another factor that might mitigate the effects of unfair treatment by helping workers maintain their self-worth even when being treated by their employers in ways they believe are illegitimate. Cohen and Wills' (1985) often-cited 'buffering' hypothesis proposed that individuals gain a sense of self-worth through the support they receive from others. Empirical findings have shown that social support at work is related to a more positive sense of self both at work and in general (Bowling, Eschleman, Wang, Kirkendall, & Alarcon, 2010). Other research has indicated that social support is followed by increases in self-esteem during adulthood (Kinnunen, Feldt, Kinnunen, & Pulkkinen, 2008), providing evidence for a causal association between the two variables. As a source of self-worth, coworker support may prevent the evaluation of unfair treatment as threatening to one's social self. Research has shown that coworker support weakens the effect of injustice on psychological well-being (Rousseau, Salek, Aube, & Morin, 2009), and it may have a similar attenuating effect on the unfair treatment–blood pressure association. Coworker support may give workers a sense that they are valued at work,

potentially weakening the effect of unfair treatment. This moderating effect may be even stronger than the one for self-esteem because coworker support comes from the same domain as the unfair treatment, thereby creating a closer match between the resource and the stressor.

Hypothesis 3: Coworker support moderates (decreases) the association between perceived unfairness and resting blood pressure.

Method

Participants

Participants for this analysis came from the Midlife Development in the United States (MIDUS) Series (Brim et al., 2007; Ryff, Almeida, et al., 2011), with all data for this analysis collected between 2004 and 2009. Participants for the MIDUS study were initially contacted between January 1995 and January 1996 by telephone through random-digit-dial recruitment methods, a random sampling of siblings of a small subset of the phone respondents and an additional oversampling of five urban metropolitan areas and twins. Participants took part in a telephone survey that was followed by a paper–pencil survey, with both surveys asking questions about their work and family lives and their health and well-being. There were 7108 participants in the initial phone survey. Then, between 2004 and 2006, MIDUS researchers attempted to contact all of the 7108 original phone survey participants. Of these original participants, 4963 were contacted for a follow-up phone interview, making for a longitudinal retention rate of 70%. These individuals were mailed another paper–pencil survey, and 4032 completed and returned the survey, a completion rate of 81%.

Finally, an additional data collection effort was undertaken to collect psychological and physical health data from a subsample of these participants in a project entitled the MIDUS II Biomarkers project (Ryff, Seeman, & Weinstein, 2011). Individuals were eligible for the MIDUS II Biomarkers project if they had completed the 2004–2006 phone interview and questionnaire and were not in the city oversamples. On the basis of where they lived, eligible participants were contacted by one of three data collection sites: the University of California-Los Angeles (UCLA), the University of Wisconsin and Georgetown University. Eligible participants were first sent a recruitment packet in the mail. This was followed by a phone call during which a visit to the data collection site was scheduled. Of the participants in the first two data collections, 1054 participated in the Biomarkers project (26.1% of the 2004–2006 sample). The Biomarkers project involved several physiological assessments. Data collection for the Biomarkers project took place between 2004 and 2009. The 1054 participants in the Biomarkers project were 54.7% female and averaged 55.3 years of age, whereas the 4032 original participants who did not participate

were 53% female and averaged 55.5 years of age, indicating the Biomarkers sample was similar to the overall sample. The key predictor in this study, perceived unfair treatment, had nearly identical scores between these two groups (1.90 among the Biomarkers participants in this analysis and 1.81 among those who did not participate in the Biomarkers project).

Only participants in the Biomarkers study who were working at the time of the 2004–2006 data collection were included in this analysis. There were 573 participants who met this criterion. A portion of the study involved the recruitment of twins, which would have presented analytical and interpretive complications by creating a subset of nested observations. Therefore, for each twin pair, one of the participants was randomly selected for inclusion in these analyses, and the other was excluded. As a result, all participants were from separate families. Ultimately, 517 participants were included in the analyses. These participants averaged 50.9 years of age, 52% were women, 51.6% had at least a bachelor's degree and they worked an average of 39.9 h per week. Participants were 90.7% White, 3.7% Black or African American, 1.5% Native American or Alaska Native, 0.2% Asian, and 3.5% of another or unspecified race. See Table I for the number, age and gender composition of participants in the MIDUS studies leading up to this analysis.

Measures from initial follow-up questionnaire

Perceived unfairness

Four items were used to measure perceived unfairness at work. These items were as follows: *How often do you think you are unfairly given the jobs that no one else wanted to do?* *How often are you watched more closely than other workers?* *How often do you feel that you are ignored or not taken seriously by your boss?* And *How often has a co-worker with less experience and qualification gotten promoted before you?* Although this is not an established organizational justice scale, the first and last items map closely on to Colquitt's (2001) distributive justice measure in that these items assess the extent to which an individual's outcomes (e.g. working conditions or

promotions) are unfair. The other two items map closely on to Colquitt's measure of interpersonal justice in that these items assess the respect and appropriateness of the interpersonal treatment received from one's superiors. Response options were on a 5-point scale ranging from *never* to *once a week or more*. This scale had a coefficient alpha of 0.73.

Coworker support

Coworker support was measured with two items from Karasek and Theorell's (1990) social support scale. These items were *How often do you get help and support from your coworkers?* and *How often are your coworkers willing to listen to your work-related problems?* Responses were given on a 5-point scale ranging from *never* to *all of the time*. This scale had a coefficient alpha of 0.66.

Self-esteem

Rosenberg's (1965) 7-item scale was used to measure self-esteem. An example item from this scale is *I wish I could have more respect for myself*. Responses were on a 7-point scale ranging from *strongly disagree* to *strongly agree*. One item from this scale was removed because of a low item-total correlation (0.03). This item was *I am no better and no worse than others*. The coefficient alpha for this scale was 0.85.

Measures from the Biomarkers project

Participants in the MIDUS Biomarkers project took part in a 24-h stay at one of three General Clinical Research Centers that were located at UCLA, the University of Wisconsin and Georgetown University (see Love, Seeman, Weinstein, & Ryff, 2010, for more details). During the first day of their stay, participants were given a self-administered questionnaire that included a variety of measures of psychological well-being along with a questionnaire on sleep and medical history. During the morning of the second day, they were given a physical examination.

As part of this larger physical examination, three resting diastolic and systolic blood pressure readings were taken by nurses, with a maximum of 30 s between each measurement. The means of the last two readings for diastolic and systolic pressure were used in the analysis. Intercorrelations between blood pressure readings for the entire Biomarkers sample ranged from 0.84 to 0.90, suggesting these readings were reliable.

Control variables

Several control variables were included in the analysis. Firstly, gender was controlled for to account for the differences in blood pressure between men and women. Research has also shown different results for men and women in studies on the associations between job demands and blood pressure, with effects being stronger among men (Schwartz, Pickering, & Landsbergis, 1996). Thus, interactions between gender and the predictors

Table I. Participant characteristics across the MIDUS studies

	Original MIDUS sample	MIDUS 2 follow-up	MIDUS Biomarkers participants	Participants in this analysis
<i>N</i>	7108	4963	1054	517
% women	52	53	55	52
Mean age	46	55	55	51

MIDUS: Midlife Development in the United States.

Table II. Means, standard deviations and correlations among study variables

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	Mean	SD
1. Age	53.50	9.38	-	0.03	-0.10	-0.02	-0.10	0.01	0.24*	-0.16*	-0.22*	-0.02	-0.02	0.36*	53.92	9.36
2. Lag	27.06	14.18	0.04	-	-0.09	-0.05	-0.11	-0.02	0.04	-0.14*	-0.06	0.07	-0.13*	-0.17*	29.05	15.25
3. Smoker	0.18	0.34	-0.02	-0.02	-	0.01	-0.09	-0.12*	-0.09	0.02	-0.02	0.05	0.00	-0.05	0.10	0.30
4. Relative with high blood pressure	0.64	0.48	-0.17*	0.01	0.06	-	0.12*	-0.02	0.16*	0.04	-0.03	-0.09	0.11	0.06	0.72	0.45
5. BMI	29.85	5.63	-0.01	-0.08	0.00	0.03	-	-0.10	0.15*	0.22*	-0.16	-0.09	0.26*	0.32*	29.01	6.41
6. Exercises regularly	0.81	0.39	-0.07	0.00	-0.08	0.06	-0.21*	-	-0.03	-0.03	0.07	0.03	-0.03	-0.07	0.80	0.40
7. Blood pressure medication	0.26	0.44	0.35*	0.08	-0.02	0.09	0.12	-0.13*	-	-0.01	0.08	-0.07	0.09	0.21*	0.32	0.47
8. Unfairness	1.95	0.80	-0.20*	0.03	0.11	0.05	0.02	-0.05	-0.09	-	-0.27*	-0.33*	0.20*	0.11	1.86	0.83
9. Self-esteem	5.82	1.10	0.12	0.07	-0.05	-0.03	0.02	0.10	0.06	-0.30*	-	0.16*	0.00	0.08	5.76	1.15
10. Coworker support	3.61	0.70	0.00	-0.01	-0.04	-0.01	-0.08	-0.02	0.04	-0.31*	0.14	-	0.01	0.00	3.65	0.75
11. Diastolic blood pressure	79.17	9.95	0.04	-0.08	-0.06	0.00	0.02	0.09	-0.13*	0.09	-0.02	-0.07	-	0.64*	73.59	9.43
12. Systolic blood pressure	132.45	16.06	0.25*	-0.07	0.00	0.05	0.18*	0.01	0.05	-0.01	0.04	-0.08	0.63*	-	127.82	18.52

* $p < 0.05$. Correlations and descriptives above and right of the diagonal are for women. Correlations and descriptives below and left of the diagonal are for men. $N = 233-248$ for men and 240-269 for women. Lag = time lag between survey and physical examination, in months. Smoker coded as 1 = smoker, 0 = nonsmoker. Relative with high blood pressure coded as 1 = has a relative with high blood pressure, 0 = does not have a relative with high blood pressure. BMI: body mass index. Exercise regularly coded as 1 = exercises regularly, 0 = does not exercise regularly. Blood pressure medication coded as 1 = takes blood pressure medication, 0 = does not take blood pressure medication.

were also analysed to determine if any of the main and interactive effects differed across men and women. The second control variable was age. Blood pressure tends to increase with age, and this needed to be accounted for in the event that age was correlated with other substantive variables in the study. The third control variable was the time lag between the questionnaire and the Biomarkers data collections, given that the physical examination portion of the Biomarkers project was not conducted at the same point in time for all participants. Additionally, participants were asked if they had a blood relative with high blood pressure and if they were taking blood pressure medication. These responses were dummy coded and entered as control variables in analyses. Participants' body mass index was computed as part of the physical examination and was also controlled for in analyses given its association with blood pressure. Finally, participants were asked if they currently smoked cigarettes regularly and if they exercised for at least 20 min, three times per week. These responses were each entered as control variables using dummy coding.

Results

Means, standard deviations and correlations among study variables for men and women are shown in Table II. A confirmatory factor analysis was conducted on the three self-reported scales using LISREL 8.80 (Joreskog & Sorbom, 2007). Results indicated that the

measurement model had good fit, $\chi^2(51) = 145.23$, root mean square error of approximation = 0.06, standardized root-mean-square residual = 0.04, goodness-of-fit index = 0.95, comparative fit index = 0.97, and all standardized factor loadings were above 0.50. Latent factor intercorrelations ranged from -0.34 to 0.08 , indicating that although some of the factors were correlated, none approached redundancy. Thus, the measurement model was considered to be strong enough to proceed with further analyses.

Multiple and moderated regression models were used to test the hypotheses. Unfairness, self-esteem and coworker support were standardized prior to the creation of the product terms and entry into the models. Tables III and IV show results from hierarchical regression models for diastolic and systolic blood pressure, respectively. For each set of models, the control variables were entered at step 1; perceived unfairness, self-esteem and coworker support were entered at step 2; and the unfairness–self-esteem and unfairness–coworker support product terms were entered at step 3 to test if there was an overall interaction between unfairness and each hypothesized moderator. Then, the product terms for gender and unfairness and for gender and self-esteem were entered in step 4a to see if the direct effects of unfairness and self-esteem were moderated by gender. Finally, in step 5a, the three-way interaction between gender, self-esteem and unfairness

Table III. Predicting diastolic blood pressure

	Unstandardized beta weights						
	Step 1	Step 2	Step 3	Step 4a	Step 5a	Step 4b	Step 5b
Intercept	69.69*	68.85*	68.88*	68.90*	69.17*	69.16*	69.50*
Age	0.03	0.06	0.06	0.06	0.05	0.06	0.06
Lag	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
Smoker	-0.69	-0.93	-0.92	-0.90	-0.81	-0.96	-0.78
Relative with high blood pressure	1.40	1.38	1.36	1.38	1.43	1.42	1.39
BMI	0.27*	0.25*	0.25*	0.25*	0.25*	0.24*	0.24*
Exercise regularly	0.86	0.89	0.87	0.88	0.87	0.82	0.71
Blood pressure medication	-1.16	-1.08	-1.08	-1.11	-1.11	1.04	-1.21
Gender	-5.28*	-5.22*	-5.22*	-5.23*	-5.38*	-5.25*	-5.97*
Unfairness		1.55*	1.52*	1.19	1.19	1.13	1.44*
Self-esteem		0.15	0.18	-0.18	-0.28	0.16	0.12
Coworker support		0.39	-0.38	0.37	0.35	-0.21	-0.20
Unfairness * self-esteem			-0.10	-0.06	0.20	-0.07	-0.01
Unfairness * coworker support			-0.07	-0.08	-0.07	-0.05	1.23
Gender * unfairness				0.62	0.54	0.77	0.29
Gender * self-esteem				0.66	0.81		
Gender * coworker support						1.08	0.91
Gender * self-esteem * unfairness					-0.53		
Gender * coworker support * unfairness							-2.49*
ΔR^2	0.11*	0.02*	0.00	0.00	0.00	0.00	0.01*

* $p < 0.05$. Lag: time lag between survey and physical examination, in months. Smoker coded as 1 = smoker, 0 = nonsmoker. Relative with high blood pressure coded as 1 = has a relative with high blood pressure, 0 = does not have a relative with high blood pressure. BMI: body mass index. Exercise regularly coded as 1 = exercises regularly, 0 = does not exercise regularly. Blood pressure medication coded as 1 = takes blood pressure medication, 0 = does not take blood pressure medication. Gender coded as 0 = man, 1 = woman.

Table IV. Predicting systolic blood pressure

	Unstandardized beta weights						
	Step 1	Step 2	Step 3	Step 4a	Step 5a	Step 4b	Step 5b
Intercept	83.61	83.31*	82.20*	82.20*	82.28*	82.67*	83.01*
Age	0.53*	0.55*	0.56*	0.56*	0.56*	0.56*	0.57*
Lag	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.08
Smoker	-0.23	-0.48	-0.22	-0.17	-0.15	-0.28	-0.07
Relative with high blood pressure	1.36	1.34	1.30	1.32	1.33	1.38	1.36
BMI	0.77*	0.75*	0.75*	0.76*	0.76*	0.74*	0.74*
Exercise regularly	-0.15	-0.27	-0.07	-0.05	-0.05	-0.15	-0.29
Blood pressure medication	-0.22	-0.20	-0.42	-0.47	0.47	0.34	-0.55
Gender	-3.96*	-3.85*	-3.87*	-3.90*	-3.94*	-3.93*	-4.80*
Unfairness		1.69*	1.52	0.90	0.91	0.85	1.23
Self-esteem		0.76	0.71	-0.07	-0.10	0.68	0.63
Coworker support		0.28	0.21	0.20	0.20	-0.79	-0.78
Unfairness * self-esteem			0.20	0.28	0.36	0.27	0.33
Unfairness * coworker support			-1.12	-1.15	-1.14	-1.10	0.46
Gender * unfairness				1.18	1.16	1.35	0.77
Gender * self-esteem				1.43	1.47		
Gender * coworker support						1.85	1.65
Gender * self-esteem * unfairness					-0.15		
Gender * coworker support * unfairness							-3.02*
ΔR^2	0.18*	0.01	0.00	0.00	0.00	0.00	0.01*

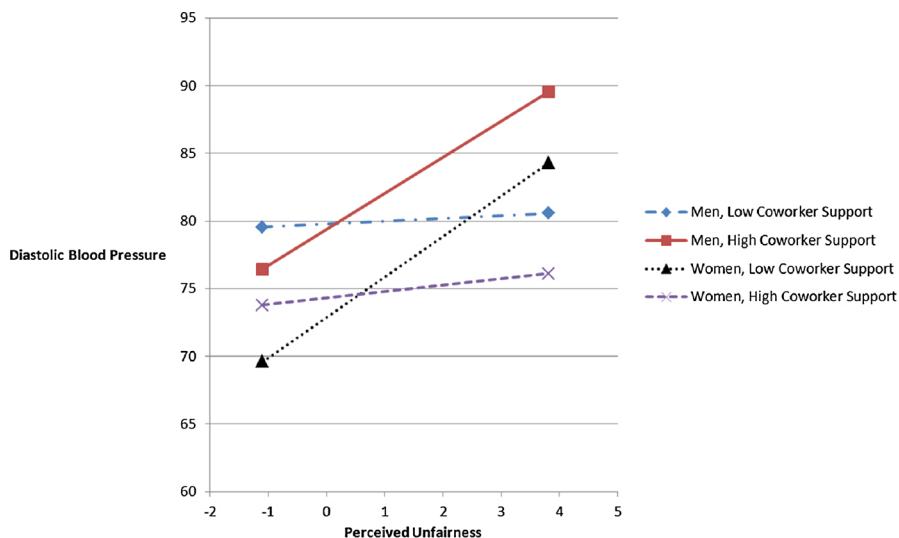
* $p < 0.05$. Lag: time lag between survey and physical examination, in months. Smoker coded as 1 = smoker, 0 = nonsmoker. Relative with high blood pressure coded as 1 = has a relative with high blood pressure, 0 = does not have a relative with high blood pressure. BMI: body mass index. Exercise regularly coded as 1 = exercises regularly, 0 = does not exercise regularly. Blood pressure medication coded as 1 = takes blood pressure medication, 0 = does not take blood pressure medication. Gender coded as 0 = man, 1 = woman.

was entered to determine if the moderating effect of self-esteem differed across men and women. Steps 4b and 5b repeated steps 4a and 5a, but instead examined interactions between gender and coworker support and the three-way interaction between gender, coworker support and unfairness to determine if the moderating effect of coworker support differed across men and women.

As seen in Table III, perceived unfairness was a significant predictor of diastolic blood pressure after entering the control variables, $B = 1.55$, $p = 0.002$, $\Delta R^2 = 0.02$. This supported hypothesis 1. The interactions between unfairness and self-esteem, $B = -0.10$, $p = 0.791$, and coworker support, $B = -0.07$, $p = 0.880$, were nonsignificant. Thus, there was no support for hypotheses 2 and 3 for the overall sample in predicting diastolic blood pressure. Gender did not interact with unfairness or self-esteem in predicting diastolic blood pressure, and there was no three-way interaction among these variables either. However, there was a three-way interaction between gender, coworker support and unfairness, $B = -2.49$, $p = .006$, with the direction of the interaction indicating that coworker support decreased the association between unfairness and diastolic blood pressure among women but not among men, providing support for hypothesis 3 among women. See Figure 1 for an illustration of this three-way interaction. As seen in Figure 1, perceived

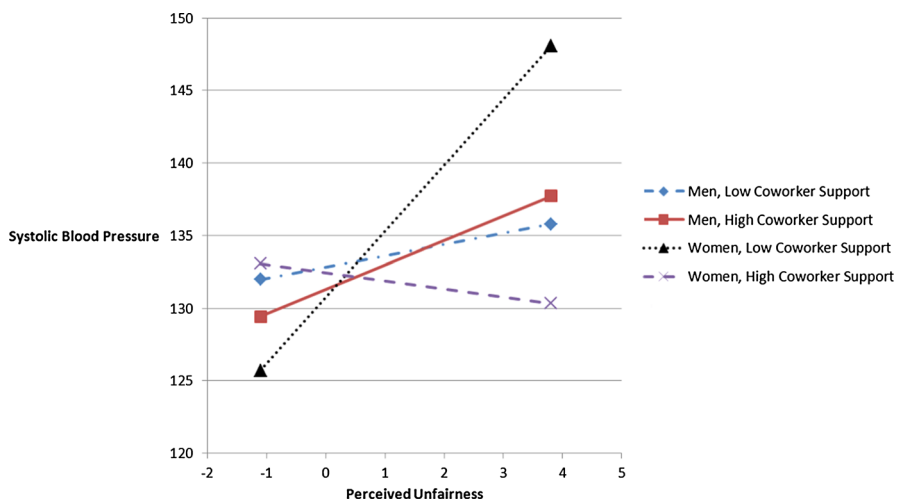
unfairness was associated with diastolic blood pressure among all participants, and coworker support interacted with perceived unfairness as hypothesized among women. However, the interaction was of the opposite pattern among men, with perceived unfairness more strongly associated with diastolic blood pressure across those with high coworker support.

Table IV shows results for models predicting systolic blood pressure. Perceived unfairness was significantly related to systolic blood pressure after entering the control variables, $B = 1.69$, $p = 0.033$, $\Delta R^2 = 0.01$. The interactions between unfairness and self-esteem, $B = 0.20$, $p = 0.750$, and between unfairness and coworker support, $B = -1.12$, $p = 0.132$, were nonsignificant. Thus, there was no support for hypotheses 2 and 3 overall. There was no significant interaction between gender and unfairness or self-esteem either. However, there was a three-way interaction between gender, coworker support and unfairness, $B = -3.02$, $p = 0.042$, $\Delta R^2 = 0.01$, with the direction of the interaction indicating that coworker support decreased the effect of unfairness on systolic blood pressure more so among women than among men. As seen in Figure 2, perceived unfairness was strongly related to systolic blood pressure among women with low levels of coworker support, whereas it was unrelated to systolic blood pressure among women with high levels of coworker support. Among men, perceived



Note. Low and high coworker support represent 1 standard deviation below and above the mean. Perceived unfairness values are standardized and range from the minimum to maximum value. Point estimates were computed using the regression weights, with means entered for all control variables.

Figure 1. Three-way interaction between perceived unfairness, coworker support and gender predicting diastolic blood pressure



Note. Low and high coworker support represent 1 standard deviation below and above the mean. Perceived unfairness values are standardized and range from the minimum to maximum value. Point estimates were computed using the regression weights, with means entered for all control variables.

Figure 2. Three-way interaction between perceived unfairness, coworker support and gender predicting systolic blood pressure

unfairness was positively related to systolic blood pressure regardless of coworker support level. Thus, there was support for hypothesis 3 among women but not among men.

Discussion

This analysis adds to the literature on the relationship between perceived fairness at work and worker physical health. This main effect of unfairness on both systolic

and diastolic blood pressure has practical and theoretical importance in that it points to high blood pressure as a potential mechanism through which unfairness may influence cardiovascular disease, complementing evidence from Wager, Fieldman, and Hussey's (2003) small-sample ambulatory blood pressure study, which found that workers had higher blood pressure when under unfavourable supervisors. One of the only other studies to specifically examine the association between

fairness and resting blood pressure in a sizeable sample was the Whitehall II study (Kivimaki et al., 2008). The correlations between fairness and diastolic blood pressure in the Whitehall II study were significant but substantially smaller than those observed here. One could only speculate as to the reason for this difference. Perhaps there was greater heterogeneity in this sample relative to the Whitehall II study, which was based on London office staff in civil service departments. US workers may also show greater psychological and physical sensitivity than UK workers to unfair treatment. The correlation observed here may also have been larger because of other idiosyncracies of the MIDUS Biomarkers sample or the fairness measures. This speculation aside, the effect sizes suggest at the very least that the associations among workplace fairness, blood pressure and cardiovascular health warrant further consideration.

In addition, the association between unfairness and both diastolic and systolic blood pressure was stronger among women with low levels of coworker support, whereas coworker support did not moderate the effect of unfairness on resting blood pressure among men as hypothesized. On the other hand, self-esteem had no moderating effect on the fairness–blood pressure association. This analysis is the first to examine personal and social resources as moderators in the relationship between workplace fairness and resting blood pressure and suggests that women with low levels of coworker support are the most vulnerable to the observed effects.

Theoretical implications

This study's results are consistent with the notion that unfair treatment is associated with a higher level of habitual arousal, manifesting in higher resting blood pressure. As noted in the introduction, one potential reason for an association between unfairness and blood pressure is that fairness in and of itself is a fundamental human need. Chronic unfairness over time may lead to high levels of baseline or resting blood pressure by threatening this fundamental human need for fairness. The association between unfairness and blood pressure among women was also stronger when coworker support was low. These results suggest that women with fewer social resources are the most vulnerable to higher blood pressure when in an unfair situation. The results from this analysis are consistent with other research suggesting that social support at work is negatively related to blood pressure under high-stress conditions (Karlin, Brondolo, & Schwartz, 2003). Contrary to the hypothesis, however, self-esteem did not moderate the effects of unfair treatment on blood pressure, suggesting that it is not in itself a protective factor. Other research findings suggest that the effects of unfairness on strain in general may actually be stronger among individuals with high and/or unstable self-esteem (Ferris et al., 2012; Meier, Semmer, &

Hupfeld, 2009). In light of these findings, future research on the link between fairness and blood pressure might consider self-esteem level and variability in a more nuanced way.

It should be noted that the overall main effect of unfairness on blood pressure was consistent across men and women (see Figures 1 and 2), even though the interaction between unfairness and coworker support in predicting diastolic and systolic blood pressure was only in the expected direction among women. Regarding the main effects, it is important to contrast these findings with research on the demand–control model (Karasek & Theorell, 1990), which has found more consistent results in predicting the blood pressure of men than that of women in high demand–low control jobs (e.g. Schwartz et al., 1996). Here, the main effects did not significantly differ across men and women. It is not clear as to why there was a gender difference in the interaction between unfairness and coworker support. There is research suggesting that support *from* women reduces cardiovascular reactivity more than support from men (Glynn, Christenfeld, & Gerin, 1999) and that the physiological reactivity of women to stressors is decreased to a greater degree by the support of a significant other (Kirschbaum, Klauer, Filipp, & Hellhammer, 1995), but other results have suggested stronger protective effects of social support among men (Kirschbaum et al., 1995). Thus, it is difficult to tell exactly why this difference was observed here. It is also possible that the specific types of unfair experiences tend to differ for men and women. Thus, gender differences in physical reactivity to chronically unfair treatment might be worth delving into in future research.

Methodological notes and limitations

This analysis has some important methodological limitations that should be noted. One important methodological limitation in this study was that the fairness measure is not one of the validated measures of organizational justice (e.g. Colquitt, 2001), rendering it more difficult to compare these results with other studies using standard organizational justice measures. Future research on physiological correlates of unfairness should expand on the findings reported here and use measures and structures of organizational justice that are more common and established. A second limitation was the off-cross-sectional nature of the study. Although not all measures were taken at the same time, no measure was taken more than once, meaning it was impossible to assess change in blood pressure. This means that we cannot empirically rule out the possibility that people with high blood pressure have a greater tendency to see situations as unfair, in which case unfair treatment does not cause high blood pressure, but instead, they both share a cause in the worker's disposition. Therefore, causal inferences about the link between unfair treatment and blood pressure are not

warranted as a result of this analysis. Future research should employ longitudinal, diary and/or experience sampling designs to examine discrete experiences and within-person changes in perceived fairness and blood pressure as well as links between fairness and the onset of hypertension.

Conclusion

Unfair treatment at work can be an important and powerful source of psychological strain, and research is now starting to identify it as an important predictor of physical strain. Results from this analysis of data

from participants in the MIDUS Biomarkers project point to perceived unfairness as a possible risk factor in high blood pressure. In addition, unfairness was associated with higher blood pressure among women with low levels of social support. Future research is needed to replicate, extend and clarify the reasons for these observed associations, including those that may be discrepant from findings in other studies. Nonetheless, blood pressure is a potential mechanism in the link between unfairness and health that warrants further consideration from occupational health researchers and practitioners.

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