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Organizational justice and cardiometabolic disease: a systematic review

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Abstract *The effects of organizational justice on workers' health have been investigated in several areas of work. However, the systematization of available information on the effects related to cardiovascular diseases (CVD) and diabetes is scarce. This article aims to systematically review the association between organizational justice and CVD and metabolic disease in adult workers. The search strategy included the terms organizational justice, coronary heart disease, cerebrovascular disease, systemic arterial hypertension, diabetes mellitus and CVD. This study investigated the following databases: MEDLINE, EMBASE, and LILACS. The quality of the studies was assessed using the instrument developed by the National Institute of Health. Results: This study identified 1,959 titles. After evaluation, eight studies were selected. Individuals with a high perception of organizational justice showed a lower risk of CVD and metabolic disease, whereas low organizational justice presented repercussions for the cardiovascular and metabolic health of workers. The development of strategies to promote organizational justice must be prioritized and thus mitigate its impacts on workers and institutions.*

Key words *Organizational justice, Occupational health, Cardiovascular diseases, Hypertension, Diabetes mellitus*

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Introduction

Cardiovascular diseases (CVD) are responsible for 31% of all deaths worldwide and are therefore a serious problem for public health. Among these, coronary artery disease and cerebrovascular disease were, respectively, the first and third causes of death in the world, according to the Global Burden of Disease Study (2017). High blood pressure and serum glucose levels are important risk factors for CVD and are associated with premature mortality and disability[1,2].

CVDs are of a multifactorial origin, with nearly 75% of the incidence of coronary artery disease explained by the risk factors: inadequate diet, sedentary lifestyle, cholesterol, excess weight, and increased blood pressure. Thus, there is still a considerable parcel of factors whose roles have still not been fully clarified in the physiopathology of this group of diseases. Several factors have been studied, such as hormonal factors, inflammatory mediators, perinatal antecedents, socioeconomic factors, and psychosocial stress[3]. The physiological mechanisms through which the psychosocial stress would be associated with CVD are as follows: the increased tonus of the sympathetic nervous system and the stimulus of the hypothalamus-pituitary-adrenal axis (Figure 1). The excessive and prolonged activation of the neuroendocrine axes, with the release of adrenaline and cortisol, can lead to the imbalance in the autonomic tonus, the production of inflammatory cytokines, and changes in the organism's energetic metabolism, in turn triggering CVD[4,5].

Stress and its associations with CVDs[6,7] and metabolic diseases[8] have been investigated in the context of work. Many authors have used work stress models to analyze the associations, including: (1) the demand-control-support[9] model, which evaluates the psychological demand of work, the degree of autonomy, and the aid provided by the supervisors and/or work colleagues; (2) the effort-reward model[10], which analyzes the balance between the effort and the perception of reward in monetary terms, social recognition, and career advancement opportunities; and more recently, a third model has also been investigated, (3) the organization justice[11,12] model, which, different from the previous two models, gives emphasis to examining collective aspects from work relationships[13]. This model consists of three dimensions: distributive, procedural, and interactional. Distributive justice is related to the allocation of rewards (monetary, social, or other) among the workers. Procedural justice concerns how decision-making procedures are performed within the institution. Interactional justice refers to the manner in which the superiors interact with their subordinates, focused on the perception of being treated with respect[14].

Most of the studies that investigated the associations between stress in the workplace and

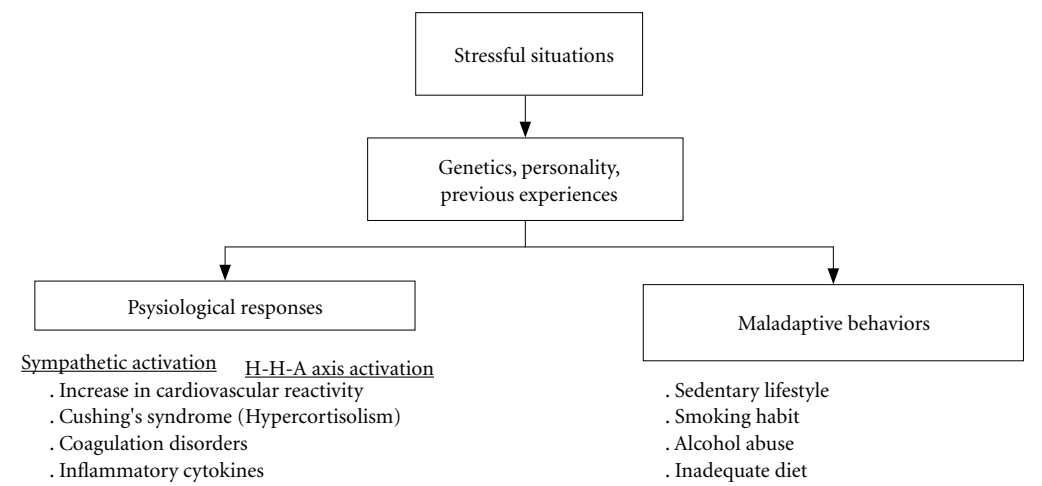

Figure 1. Physiopathological mechanisms linking stress to CVD.

Eixo H-H-A: hipotálamo-hipófise-adrenal.

Source: Authors.

CVD used the demand-control and effort-reward models, while few studies analyzed stress in the workplace using the organizational justice model. It is important to highlight that the identification of the modifiable risk factors for CVD is of utmost importance in the development of preventive actions. In this sense, the identification of characteristics of work that promote stress and configure risk factors for CVD is essential so that managers and workers can implement intervention strategies to mitigate such factors and reduce the incidence of CVD related to stress in the workplace, especially aspects related to the workplace and to relationships among workers and supervisors/managers, such as the dimension of organizational justice.

The present study proposed a systematic review of the association of stress in the workplace, using the Organizational Justice model, with cardiovascular and metabolic outcomes. To date, most of the published reviews have investigated stress in the workplace through the theoretical models of demand-control and effort-reward. In addition, it is rare to find studies that include such outcomes as hypertension and diabetes. Another relevant aspect is that these reviews tend not to include Latin American databases or gray literature. Therefore, conducting a review using a nearly unexplored theoretical model, with a broader scope in relation to the possible outcomes and expanding the databases used, brings a key contribution to existing knowledge on the theme of stress in the workplace and outcomes in health. In this light, this study aims to help workers and managers develop actions geared toward organizational justice so as to mitigate repercussions on worker health.

Method

This study was constructed using the methodological guidelines established in the Centre for Reviews and Dissemination (CDR) – CDR's guidance for undertaking reviews in healthcare[15] from the University of York. The protocol was drafted, complying with the guidelines contained in the PRISMA-P Statement – Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols[16], and was registered in the PROSPERO – International Prospective Register of Systematic Reviews database, logged under identification code CRD42020215322.

The PICOS strategy was characterized by: (1) population: adult workers; (2) phenomenon of interest: high organizational justice; (3) Comparator: low organizational justice; (4) outcomes: CVD (coronary artery disease, cerebrovascular disease, alterations in blood pressure, and alterations in glycemia); (5) study design: observational studies.

The selection criteria included male and female adult workers, employed in public or private institutions of any production activity. No restrictions were made to the local profile (levels of income/development) nor to the type of activity (specialized or non-specialized). The phenomenon of interest evaluated in this study was the perception of high organizational justice, preferably measured by means of validated quantitative questionnaires. The comparator is the perception of the levels of low organizational justice. The outcomes were as follows: CVD, coronary artery disease, cerebrovascular diseases, systemic arterial hypertension, and diabetes mellitus. No articles were excluded due to the measurement methods; however, this information will be pointed out in the results. In the search criteria, cross-sectional, cohort, or case-control studies were included. No restrictions were placed in terms of the size of the sample or the period of follow-up, and no maximum date was imposed. Articles published in English, Portuguese, or Spanish were considered.

The review of the literature was performed by means of searches in the following databases: *Medical Literature Analysis and Retrieval System Online* (MEDLINE) via PubMed, *Excerpta Medica Database* (EMBASE), and *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS). A complementary search was performed by means of the reference lists of the identified articles, reviews, meta-analyses, and book chapters. The search within the gray literature was limited to theses and dissertations available on the Coordination for the Improvement of Higher Education Personnel (CAPES) platform of the Brazilian Ministry of Education.

The search strategy (Appendix, available from: https://doi.org/10.48331/scielodata.JKACBN) was constructed through the controlled vocabulary of each database and key word, synonyms, and spelling variations of the exposed term and of each outcome. Five combinations were set up for each database, which included the exposure (organizational justice) and an outcome (coronary artery disease, cerebrovascular disease; systemic arterial hypertension; diabetes mellitus; CVD), using the Boolean operators "*OR*" and "*AND*". To increase the sensitivity, the

database filters were not used so as to avoid any loss of articles due to indexation. The database search took place from August 4, 2020, to February 20, 2021, in the MEDLINE, EMBASE, and LILACS databases. In addition to the electronic databases, an additional search was performed in the CAPES catalogue of theses and dissertations, and the reference lists of the relevant books and articles were read. The search was updated on November 28, 2021.

Two reviewers worked independently in the study survey. Through the defined criteria, 2,405 citations were found in the databases and ten through manual searches (Figure 2). The articles were selected using the Rayyan software[17]. In this study, 446 duplicates were found. After their removal, 1,959 publications were evaluated based on the title and the abstract, resulting in 19 articles to be evaluated in full. Among these, 15 presented other models of stress in the workplace that were related to organizational justice and seven were excluded due to the fact that the outcomes did not correspond to the established criteria. The selection process used the blinding tool, which was only disabled after all of the articles had been evaluated by both reviewers. The disagreement cases were discussed and resolved by consensus. In the end, eight studies remained to be evaluated.

The data were extracted independently, through a form, where the following relevant information was inserted: identification of the studies, year, methodology (design, duration, sample size, participation rate, and follow-up rate), demographic characteristics, and co-variables. In relation to the exposure and to the outcomes, the type and form of measurement were recorded. The findings are described through narrative synthesis.

The evaluation of the quality of the studies was performed using the tool developed by the National Institute of Health (NIH- Study Quality Assessment Tools)[18] for cohort and cross-sectional studies. In the end, four studies were considered to be of good quality and four of reasonable quality. The following table (Chart 1) lists the evaluated items and the final classification of the quality of each study selected for the present review.

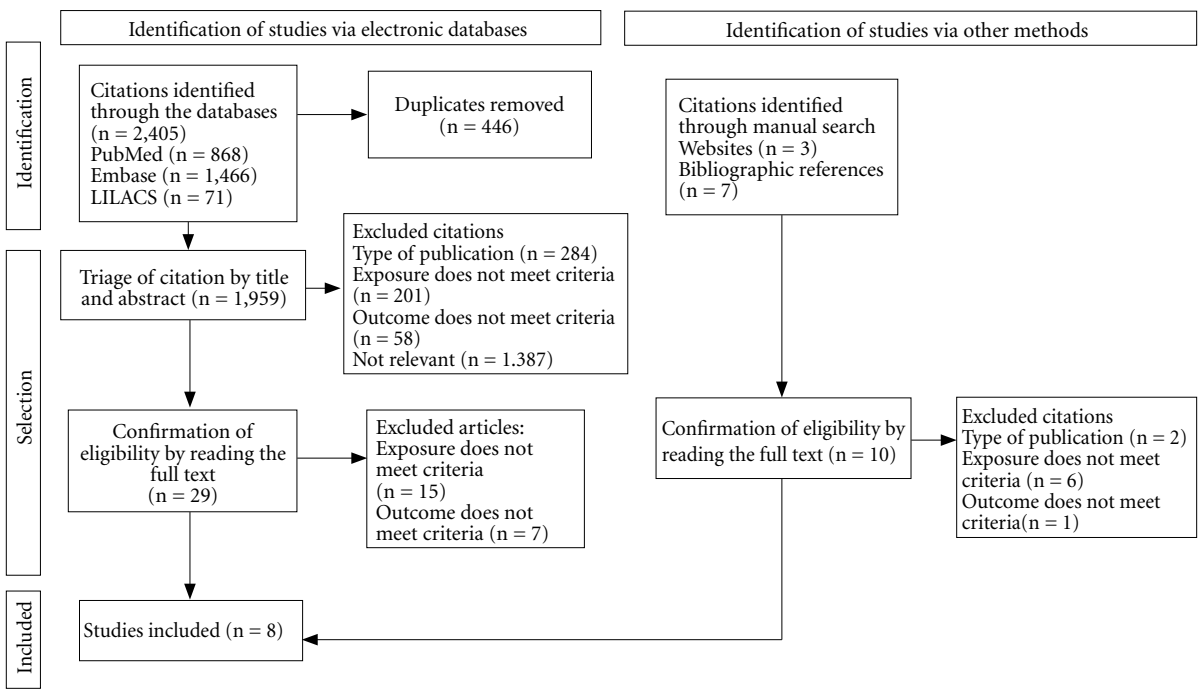

Figure 2. Selection studies – PRISMA flow chart.

Source: Authors, adapted from "The PRISMA 2020 statement: an updated guideline for reporting systematic reviews". *J Clin Epidemiol* 2021; 134:178-189.

Chart 1. Quality assessment of the study according to criteria from the Quality Assessment Tool – National Institute of Health.

Criteria	Kivimäki 2005[19]	Elovainio 2006[23]	Kivimäki 2008[20]	Gimeno 2010[21]	Inoue 2015[24]	Rineer 2017[23]	Varga 2021[22]	Xu 2021[27]
1. Was the research question or objective in this paper clearly stated?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Was the study population clearly specified and defined?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
3. Was the participation rate of eligible persons at least 50%?	Yes	NR	Yes	Yes	Yes	NR	Yes	Yes
4. Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Was a sample size justification, power description, or variance and effect estimates provided?	NR	NR	NR	NR	NR	Yes	NR	Yes
6. For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?	Yes	Yes	Yes	Yes	No	No	Yes	Yes
7. Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?	Yes	Yes	Yes	Yes	NA	NA	Yes	Yes
8. For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
9. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
10. Was the exposure(s) assessed more than once over time?	Yes	No	Yes	Yes	NA	NA	Yes	Yes
11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12. Were the outcome assessors blinded to the exposure status of participants?	NR	Yes	NR	NR	NR	NR	NR	NR
13. Was loss to follow-up after baseline 20% or less?	Yes	NA	CD	No	NA	NA	No	Yes
14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?	Yes	NA	Yes	Yes	Yes	Yes	Yes	Yes
Quality rating (good, fair, or poor):	Good	Fair	Good	Fair	Fair	Fair	Good	Good

*CD: cannot determine; NA: not applicable; NR: not reported.

Source: Authors.

Results

Chart 2 describes the characteristics of the studies selected for the current review. The identified articles in this review all come from industrialized and high-income countries (The United Kingdom [UK], Japan, and the United States [USA]) and were published between 2005 and 2021. The samples mostly consisted of men, 67-100%) and average ages varied between 39 and 45 years. Of the six articles, only four indicated race/color and presented approximately a 90% participation of white individuals. Regarding the design of the studies, six were cohort studies and

Chart 2. Characteristics of the selected studies according to the study design, investigated population, exposure, and examined outcome.

First author/ year (reference number)	Kivimäki 2005 (19)	Elovainio 2006 (23)	Kivimäki 2008 (20)	Gimeno 2010 (21)	Inoue 2015 (24)	Rineer 2017 (23)	Varga 2021 (22)	Xu 2021 (27)
Location	United Kingdom	Finland	United Kingdom	United Kingdom	Japan	United States of America	United Kingdom	Finland
Investigated population	Civil servants (man)	Industry workers (67% men and 33% women)	Civil servants (70.1% men and 29.9% women)	Civil servants (69.6% homens e 30.4% mulheres)	Civil servants (69.6% men and 30.4% women)	Civil construction workers (89.6% men and 10.4% women)	Industry workers (68% men and 32% women)	Civil servants (23% men and 77% women)
Study design	Cohort	Cohort	Cohort	Cohort	Cross-sectional	Cross-sectional	Cohort	Cohort
Number of participants	6,442	804	6,062	6,321	4,499	290	8,182	49,835
Age when entering study (age range and average age)	35-55 years (average per group on perception of justice: low – 43.6/ intermediate – 43.7/ high – 44.2)	Average per group according to the perception of justice: low or intermediate – 39.1 high-36.4	35-55 years (average 44)	35-55 years (average in men 44.8 years and in women 45.4 years)	Average in men 41.5 years and in women 40.9 years	Average 44.8 years	Average 44,4 years	40-65 years (average 48)
Ethnicity	93% white and 7% others	NR	89.4% white and 10.6% others	91.3% white and 8.7% others	NR	NR	91% white and 9% others	NR
Participation rate	73%	NR	73%	73%	90.1% in industry 1 and 96.2% in industry 2	NR	73%	65% to 71%
Average time of follow-up	8.7 years	25.6 years	9.6 years	18 years	NA	NA	25 years	10.9 years
Follow-up rate	0.93	NR	NR	0.59	NA	NA	NR	NR
Type of organizational justice investigated (exposure)	Interactional justice	Justice at work	Interactional justice	Interactional justice	Procedural justice and interactional justice	Procedural and distributive justice	Interactional justice	Procedural justice

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Chart 2. Characteristics of the selected studies according to the study design, investigated population, exposure, and examined outcome.

First author/ year (reference number)	Kivimäki 2005 (19)	Elovainio 2006 (23)	Kivimäki 2008 (20)	Gimeno 2010 (21)	Inoue 2015 (24)	Rineer 2017 (23)	Varga 2021 (22)	Xu 2021 (27)
Exposure measurement method	Self-applied justice questionnaire developed for the Whitehall II Study	Response to the affirmation "my supervisor treats me fairly" (Likert scale)	Self-applied justice questionnaire developed for the Whitehall II Study	Self-applied justice questionnaire developed for the Whitehall II Study	Organizational justice Questionnaire (Moorman)	Questionnaire of Price and Mueller and Organizational Justice Questionnaire (Moorman)	Self-applied justice questionnaire developed for the Whitehall II Study	Organizational justice Questionnaire (Moorman)
Number of evaluations of exposure	2	1	2	2	1	1	2	7
Main outcomes	CHD death, first nonfatal myocardial infarction, or definite angina	Death by CVD (ischemic heart disease, other heart diseases, cerebrovascular diseases and other CVDs, according to the ICD-10)	Systolic blood pressure, Diastolic blood pressure, CHD death, first nonfatal myocardial infarction, or definite angina	Blood pressure, blood glucose, metabolic syndrome (according to criteria from NCEP/ ATP III and AHA/NHLBI)	Systemic arterial hypertension	Systemic arterial hypertension	Waist circumference, hip circumference, BMI; fasting glucose, fasting insulin, systolic and diastolic blood pressures, triglycerides, LDL cholesterol, HDL cholesterol, and total cholesterol	Type 2 Diabetes
Number of evaluations of outcome	2	continuous	2	3	1	1	5	continuous
Other investigated variables	Marital status, level of education, type of activity, total cholesterol, BMI, smoking habit, blood pressure, alcohol consumption, physical activity, other models of stress in the workplace	Occupation, smoking habit, physical activity, systolic blood pressure, total cholesterol, BMI, other stress factors in the workplace (demand-control, effort-reward)	Socioeconomic condition	Type of work	Level of education, occupation, work activity, chronic diseases (treatment for stroke, myocardial infarction, hypertension, diabetes mellitus, hyperlipidemia), psychological stress (K6 scale), smoking habit, alcohol consumption, physical activity, BMI, HDL cholesterol, LDL cholesterol, and triglycerides	Sex, marital status, childcare and eldercare responsibilities, number of hours worked per week, time working at the company, position (supervisor, leader, member of a team, or other), use of antihypertensive drugs	Age, ethnicity, marital status, income, type of job activity, smoking habit, systemic arterial hypertension, alcohol consumption, physical activity	Age, marital status, level of education, type of job activity, type of contract (permanent/ nonpermanent), alcohol consumption, physical activity, BMI, previous diseases

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Main results	Lower risk for coronary disease (HR 0.65; 95% IC- 0.47-0.89) in participants with high levels of interactional justice. Association remained after adjustment for: cholesterol, BMI, smoking habit, hypertension, alcohol consumption, physical activity, and other stress factors related to the workplace (demand-control and effort-reward models)	Lower risk of death in participants with a high level of justice (HR 0.55- 95% CI 0.34-0.88). Association remained after adjustment for: occupation, smoking habit, physical activity, systolic blood pressure, and BMI (HR 0.59; 95% CI 0.36-0.96) and after adjustment for stress factors in the workplace according to the demand-control and the effort-reward models (HR 0.56; 95% CI 0.34-0.92). When both adjustments were performed, the HR was 0.61 with a 95% CI 0.36-1.00.	Lower risk for coronary artery disease in participants with high organizational justice (HR 0.87- 95% CI 0.77-0.98).	Lower risk of developing high blood pressure in men with high levels of organizational justice (HR 0.86; 95% CI 0.78-0.95). Regarding the increase in blood glucose, no association was found (in men HR 1.09; 95% CI 0.87-1.36 and in women HR 0.80; 95% CI 0.87-1.19).	No association was found between procedural and interactional justice and the blood pressure levels of the participants	No association was found between procedural and distributive justice and the blood pressure levels of the participants	No association was found between procedural justice and glycemic and blood pressure levels of the participants.	Workers exposed to a work environment of a vertically favorable dimension (intermediate to high organizational justice, associated with quality leadership, but with low support from colleagues and culture of collaboration), a lower incidence of type 2 diabetes was observed (HR 0.87; 95% CI 0.78-0.97), when compared to workers exposed to an unfavorable work environment.

NR: not reported; NA: not applicable; CHD: coronary heart disease; BMI = body mass index; NCEP/ATP III: Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III); AHA/NHLBI: American Heart Association/National Heart, Lung and Blood Institute; HR = Hazard ratio; 95% CI= 95% confidence interval; ICD-10: International Classification of Disease – 10th edition.

Source: Authors.

two were cross-sectional studies. Concerning the number of participants, the studies included at least 290 and at maximum 49,835 participants. The workers that participated in the studies were civil servants, hospital workers, industry workers, or civil construction workers. Interactional justice was the most common dimension evaluated in the selected studies. The instruments used to investigate organizational justice were: (1) the self-applied justice questionnaire, developed for the Whitehall II study; (2) the Moorman Organizational Justice questionnaire; and (3) answer to the affirmation "my supervisor treats me fairly" (Likert scale). As regards the results, the cohort

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studies found an association between low organizational justice level and CVD and metabolic disease.

Articles 1, 2, 3, and 4 are derived from the Whitehall II study, a prospective cohort from the UK, begun in 1985 and is still ongoing. This study recruited 10,308 individuals (participation rate of 73%), with 6,895 men and 3,414 women, aged 35 to 55 years, civil servants from 20 departments. In this cohort, the perception of the justice in the workplace was evaluated in the first two waves of data collection, performed through a self-applied questionnaire, consisting of five questions (Cronbach's alpha, $\alpha = 0.72$), exploring interactional aspects of organizational justice, with answers on a 4-point Likert scale. The obtained score was divided into thirds, given that the lower score was considered to be "low justice", followed by "intermediate justice", and the highest being "high justice".

Article 1 – Justice at work and reduced risk of coronary heart disease among employees – the Whitehall II Study[19]

The aim of this study, published in 2005, was to evaluate justice at work as a predictor of coronary heart disease. Data were analyzed from 6,442 male individuals with no history of coronary heart disease until the second data collection. Women were excluded from the evaluation due to the low incidence of events during follow-up, which was on average of 8.7 years. The evaluated outcomes were: death by coronary artery disease, first non-fatal myocardial infarction, and documented angina. Workers who reported high levels of justice showed a hazard ratio (HR) for arterial disease of 0.65, with a 95% confidence interval (95%CI) of 0.47-0.89, as compared to the referred low and average levels of justice after having adjusted for age and type of work, suggesting a protective effect. The association was maintained after the inclusion of other variables within the model, such as the cholesterol level, the body mass index (BMI), smoking habit, hypertension, alcohol consumption, and levels of physical activity (HR 0.71; 95%CI 0.51-0.99). When there was an insertion of other stress factors related to work and to the statistical model (demand-control and effort-reward), the association remained significant (HR 0.69; 95%CI 0.49-0.98).

Article 2 – Effects on blood pressure do not explain the association between organizational justice and coronary heart disease in the Whitehall II Study[20]

Another study related to the Whitehall II cohort, published in 2008, evaluated 4,250 men and 1,812 women free of systemic arterial hypertension and coronary heart disease in the first two waves of data collection. The average period of follow-up was 9.6 years. This study observed an incidence of systemic arterial hypertension (blood pressure greater then or equal to 140/90 mmHg) and of coronary heart disease (death by coronary artery disease, first non-fatal myocardial infarction, and documented angina). Our study also followed up on the values of systolic and diastolic blood pressure and the variation in blood pressure during the period of follow-up. No association was found between organizational justice and average diastolic blood pressure (correlation coefficient -0.04), alteration in systolic blood pressure (correlation coefficient -0.03), or diastolic blood pressure (correlation coefficient -0.04), adjusted by age, sex, ethnicity, and socioeconomic position. High levels of organizational justice showed protection concerning the incidence of coronary artery disease (HR 0.87; 95%CI 0.77-0.98) when adjusted by age, sex, ethnicity, and socioeconomic position. When making the additional adjustment with the blood pressure measurements (averages of systolic, diastolic, and variation) and systemic arterial hypertension, the association remained (HR 0.87; 95%CI 0.77-0.98).

Article 3 – Justice at work and metabolic syndrome: the Whitehall II Study[21]

This study brings relative information on the follow-up of 6,123 individuals (4,398 men and 1,923 women) for an average period of 18 years. After adjusting for sex, ethnicity, and type of work, it was found that those male participants who reported high levels of justice presented a lower risk of developing high blood pressure (HR 0.86; 95%CI 0.78-0.95). In women, this association was not found (HR 1.02; 95%CI 0.87-1.19). In relation to the increase in glycemia, no association between organizational justice and alterations in levels of glycemia was found, both in men (HR 1.09; 95%CI 0.87-1.36) and in women (HR 0.80; 95%CI 0.54-1.19). A second analysis was performed, removing all of the individuals who had any type of alteration (high total choles-

terol, diabetes, obesity, or high blood pressure) in the baseline. Thus, 3,305 participants (50% men and 42.4% women) were excluded. In the new analysis, there was a greater reduction in the risk of high blood pressure in male individuals who reported a high level of justice (HR 0.79; 95% CI 0.70-0.90).

Article 4 – Organizational justice and long-term metabolic trajectories: a 25-year follow-up of the Whitehall II Cohort[22]

This study is yet another publication of the Whitehall II cohort, in which 11 biomarkers were analyzed (waist circumference, hip circumference, BMI, glycemia after fasting, insulin after fasting, triglycerides, total cholesterol, HDL, LDL, and systolic and diastolic blood pressure), collected on five occasions, within a 25-year period. The sample of 8,182 individuals consisted mostly of men (68%), white (91%), and with a high level of education (47% had 8 years or more of study). Adjustments were made for age, sex, ethnicity, level of education, and income in all analyses. Over time, the population of the study worsened in all of the anthropometric measurements, of glycemic profile and systolic blood pressure. Individuals with high levels of justice had better or similar characteristics in all of the collections; however, it was never worse, when compared to individuals with low levels of justice. Moreover, individuals who reported a high justice showed a slower deterioration in the measurements of the waist, hip, and BMI. No difference was found in the evolution of the levels of glycemia and those of systolic blood pressure among the groups. In relation to the diastolic blood pressure, a difference was observed, but in a lesser magnitude (-1.1 mmHg).

Article 5 – Justice at work and cardiovascular mortality: a prospective cohort study[23]

The prospective cohort study, conducted in Finland, evaluated mortality though the following causes: ischemic heart diseases, other heart diseases, cerebrovascular diseases, other diseases of the cardiovascular system according to the International Classification of Diseases (ICD-10). The sample consisted of 804 workers from different hierarchical levels within a metallurgical industry, which had an average follow-up of 25.6 years. It was verified that the workers who were classified as having a high level of organizational justice presented a 45% lower risk of death (HR 0.55; 95%CI 0.34-0.88) in comparison to the other workers, who were classified a having average and low levels of justice in the statistical model adjusted for age and sex. This association remained significant (HR 0.59; 95%CI 0.36-0.96) when there was an adjustment for the occupational group, smoking habit, level of physical activity, systolic blood pressure, and BMI, and when other models of stress in the workplace (demand-control and effort-reward) were inserted in the model (HR 0.56; 95%CI 0.34-0.92). When both adjustments were performed simultaneously, the individuals with a high organizational justice presented a 59% lower risk of high blood pressure (HR 0.61; 95%CI 0.36-1.00).

Article 6 – Organizational justice and physiological coronary heart disease risk factors in Japanese employees: a cross-sectional study[24]

This article shows the results of the baseline from the J-HOPE (Japanese study of health, occupation and psychosocial factors related equity) cohort[24]. In a sample of 4,499 individuals (3,598 men and 901 women), in two manufacturing companies, the procedural and interactional dimension of organizational justice were evaluated by means of the Japanese version of the Moorman Organizational Justice Questionnaire. In addition to the self-administered questionnaire, clinical evaluations were conducted, in which systolic and diastolic blood pressure, weight, height, and collected exams was measured to evaluate serum lipids. The covariables analyzed were: sex, age, educational level, company in which the individual worked, occupation, workload, chronic diseases, psychological stress, smoking habit, and alcohol consumption. After the multiple logistic regression had been applied, adjusting for the aforementioned variables, no association between the procedural and interactional justice and the risk factors for coronary heart diseases was found among the investigated participants.

Article 7 – The moderating effect of perceived organizational support on the relationships between organizational justice and objective measures of cardiovascular health[25]

This was a cross-sectional study conducted in the United States, which evaluated 290 civil construction workers in two public institutions.

Questionnaires were applied to evaluate procedural justice[12] and distributive justice[26]. A clinical evaluation was performed to verify the heart rate and systolic and diastolic blood pressure. The covariables were: age, sex, marital status, responsible for child or elderly care, number of hours worked per week, time working in the company, position in the company (supervisor, leader, member of a team, or other), and the use of antihypertensive drugs. No association was found between distributive justice and systolic and diastolic blood pressure. In relation to the procedural dimension of the organizational justice, a minimally negative correlation was found when accompanied by a high perception of organizational support. However, when the organizational support was low, this association was still maintained.

Article 8 – Characteristics of workplace psychosocial resources and risk of diabetes: a prospective cohort study[27]

This study refers to an ongoing cohort in Finland. The participants are civil servants from 10 municipal governments and 21 hospitals. The sample consists of 49,835 individuals, mostly women (77%) and with a high educational level (52%). The average age is 48 years, and there is no description of race/color. Vertical (procedural justice and leadership quality) and horizontal (support among colleagues, culture of collaboration) work characteristics were evaluated, as was the incidence of diabetes type 2. There were seven data collection waves, using questionnaires validated for all of the variables related to work. Adjustments were made for age, sex, marital status, educational level, type of contract (permanent/temporary), comorbidities, and diagnosed mental disorders. The work was categorized in four types: unfavorable, vertically favorable, horizontally favorable, and vertically and horizontally favorable. After 10.9 years of follow-up, it was verified that individuals who worked in locations with vertically favorable characteristics showed a lower risk of developing diabetes (HR 0.87; 95%CI 0.78-0.97) when compared to individuals who worked in unfavorable locations. This reduction is even greater when the work is vertically and horizontally favorable (HR 0.77; 95%CI 0.68-0.86).

Discussion

Among the three studies that evaluated coronary artery disease, two belong to the Whitehall II cohort. Although there is a partial overlapping of the sample, we decided to maintain both studies, since there is a difference both in the study groups and in the analyses. Although in the 2005 study[19] the sample consisted of 6,442 male individuals and took an average time of follow-up of 8.7 years, the 2008 study[20] had a total of 6,062 people (70% male and 30% female), and took place during approximately 9.6 years of follow-up. The three studies were considered to be of high quality. As strong points, they had well-defined samples, a prospective design, a good response rate, and a low quantity of loss. Both publications presented an average time of follow-up of around ten years, which is compatible with the time for necessary for the appearance of CVD. The Whitehall II cohort, despite the considerable sample size, may have limitations in relation to the possibility of generalization. The analyzed group, even though it has socioeconomic variations, is comprised of civil servants and office workers, who may not represent other professional categories or different types of contracts. Moreover, the sample was mostly white (approximately 90%), urban, from a high-income industrialized country. An adjustment was performed for the more relevant characteristics, including for the other models of stress in the workplace (Demand-Control and Effort-Reward). In addition, "hard" outcomes, with highly objective measures, were measured, contributing to underestimate the risk. It should be observed that, as the beginning of the cohort took place before the establishment of the more accepted model of organizational justice and of the appearance of validated questionnaires, this work used its own questionnaire, developed specifically for this study, evaluating only the interactional component, facilitating the comparison with other data in the literature.

The third study, conducted in Finland[23], which included coronary artery disease among its outcomes, presented moderate quality. Mortality data were collected from the Finnish national mortality register, whose causes presented an encoding corresponding to the chapter in circulatory device diseases (chapter IX) of the tenth edition of the ICD-10. Among the studies identified in this review, this was the only one that included cerebrovascular disease. As the study does not discriminate among the pathologies, it is not possible to know if there is a difference in the in-

creased risk between coronary heart disease and strokes, for example. One of the limitations was the evaluation of the exposure only in the baseline and through the sole question (answer to the affirmation: "My supervisor treats me fairly"). It is important to highlight that the data collection occurred in 1973, when the model of justice was still in its initial development stages. Among the strongholds of this study is the prospective design and the long period of follow-up (average of 25.6 years). Adjustments were performed for the main risk factors, such as age, sex, smoking habit, physical activity, and systolic and diastolic blood pressure. The sample, comprised of 804 individuals from a metallurgical industry, presented a wide range of types of activities (among specialized and non-specialized work).

Previously published systematic reviews, using the demand-control and effort-reward models, in addition to the organizational justice, also found an association of stress in the workplace and CVD. Kivimaki[28] identified a 50% excess risk for coronary heart disease in employees with stress in the workplace. In relation to the risk of diabetes, a meta-analysis was published in 2016, in which no increased risk was observed in individuals exposed to stress in the workplace (demand-control)[8].

The evaluation of the association of organizational justice with alterations in blood pressure was described in five studies, which present some conflicting results. Data from the Whitehall II cohort, which evaluated the interactional aspects of Organizational Justice, had no correlation between the perception of high justice and average diastolic blood pressure. In a subsequent publication, it was verified that the men who reported high levels of justice had a 14% lower risk of developing high blood pressure, after an average follow-up of 18 years. The other two studies that examined blood pressure were of a cross-sectional design. In the study conducted in Japan[24], the procedural and interactional dimensions were evaluated, while in the United States, the distributive and procedural dimensions of Organizational Justice were studied. In both cases, no association was observed between hypertension and justice. It is difficult to compare these data. Since the studies have different designs, they did not evaluate the same dimensions of justice, nor did they use the same instruments. It is reasonable to suppose that the association was of a minimal magnitude and appeared only after years of exposure.

Two studies that evaluated the relationship between organizational justice and diabetes mellitus showed no association[22,29].

It was observed that there are still few studies available in the literature that investigate the association between organizational justice and cardiovascular and metabolic outcomes. A recent bibliographic analysis was published which sought to evaluate the tendencies of research in this field of organizational justice.[30] The study identified a progressive increase in interest, with more than half of all of the studies having been published in the last decade. The major concentration tends to be found in the areas of the social sciences, business administration, psychology, and the humanities, with medicine ranking fifth in the number of publications. Nearly 95% of the publications are in English, with the participation of European countries being the most prominent. In the health area, studies evaluating anxiety, depression, sleep alterations, burnout, and absenteeism are the most common. Hence, the results obtained in the search for studies for the present review seems to run in line with what is available in scientific literature.

Study limitations

One of the limitations of the present systemic review is related to the difficulty to make inferences about sociodemographic variables such as race/color, sexual orientation, income, and access to consumer goods, since these variables were not investigated in the majority of selected studies. Moreover, all of the studies were conducted in high-income countries, which made comparisons between low and middle-income countries impossible.

Practical implications of the results

Future studies should investigate organizational justice and outcomes in health in low and middle-income countries, including workers in several areas of activity and in different types of contracts, as well as the investigation of variables including race/color, gender identity, and sexual orientation. Furthermore, the investigation of the three dimensions of organizational justice and the consistent use of validated instruments can provide relevant information for the development of institutional actions and policies geared toward the levels of organizational justice.

Conclusion

Association between organizational justice and CVD was identified in this study. High organizational justice was associated with a lower risk of CVD and of fatal events caused by these diseases. Regarding glycemic levels, there was no consensus among the studies. On the one hand, two studies of the same cohort (Whitehall II) found no association between organizational justice and glycemic levels. On the other hand, one cohort study, conducted in Finland, found an association between high organizational justice and a lower risk of presenting diabetes type 2.

Collaborations

A Scalabrin and ATC Silva participated in the data collection, preparation of the original information, and write up and review of the article. PR Menezes collaborated in the write-up and review of the article. All authors participated in the approval of the final version of the article.

References

1. World Health Organization (WHO). Cardiovascular diseases (CVDs). 2017. [acessado 2020 dez 20]. Disponível em: https://www.who.int/en/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)
2. GBD 2017 Causes of Death Collaborators. Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980-2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet* 2018 10; 392(10159):1736-1788.
3. Beaglehole R, Magnus P. The search for new risk factors for coronary heart disease: occupational therapy for epidemiologists? *Int J Epidemiol* 2002; 31(6): 117-1122.
4. McEwen BS. Stress, adaptation, and disease: allostasis and allostatic load. *Ann N Y Acad Sci* 1998; 840:33-44.
5. Jarczok MN, Jarczok M, Mauss D, Koenig J, Li J, Herr RM, Thayer JF. Autonomic nervous system activity and workplace stressors – a systematic review. *Neurosci Biobehav Rev* 2013; 37(8):1810-1823.
6. Backé E-M, Seidler A, Latza U, Rossnagel K, Schumann B. The role of psychosocial stress at work for the development of cardiovascular diseases: a systematic review. *Int Arch Occup Environ Health* 2012; 85(1):67-79.
7. Fishta A, Backé EM. Psychosocial stress at work and cardiovascular diseases: an overview of systematic reviews. *Int Arch Occup Environ Health* 2015; 88(8):997-1014.
8. Sui H, Sun N, Zhan L, Lu X, Chen T, Mao X. Association between work-related stress and risk for type 2 diabetes: a systematic review and meta-analysis of prospective cohort studies. *PLoS One* 2016; 11(8):e0159978.
9. Karasek R, Theorell T. *Healthy work: stress, productivity and the reconstruction of working life*. New York: Basic books; 1990.

10. Siegrist J. Adverse health effects of high-effort/low -reward conditions. *J Occup Health Psychol* 1996; 1(1):27-41.
11. Greenberg J. Organizational justice: yesterday, today, and tomorrow. *J Manage* 1990; 16(2):399-432.
12. Moorman R. Relationship between organizational justice and organizational citizenship behaviors: do fairness perceptions influence employee citizenship. *J Appl Psychol* 1991; 76(6):845-855.
13. Miller DT. Disrespect and the experience of injustice. *Annu Rev Psychol* 2001; 52(1):527-553.
14. Greenberg J, Colquitt J, Zappata-Phelan CP. What is organizational Justice? A historical overview. In: Greenberg J, Colquitt J, editors. *Handbook of organizational justice*. Mahwah: Lawrence Erlbaum Associates Publishers; 2005. p. 3-56.
15. Akers J, Aguiar-Ibáñez R, Baba-Akbari A. *Systematic reviews: CRD's guidance for undertaking reviews in health care*. York: Centre for Reviews and Dissemination, University of York; 2009
16. Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart LA, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev* 2015; 4(1):1.
17. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan-a web and mobile app for systematic reviews. *Syst Rev* 2016; 5(1):210.
18. National Institute of Health (NIH). National Institute of Health (NIH) quality assessment tools [Internet]. [acessado 2020 set 10]. Disponível em: https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools
19. Kivimäki M, Ferrie JE, Brunner E, Head J, Shipley MJ, Vahtera J, Marmot MG. Justice at work and reduced risk of coronary heart disease among employees. *Arch Intern Med* 2005; 165(19):2245-2251.
20. Kivimäki M, Ferrie JE, Shipley M, Gimeno D, Elovainio M, de Vogli R, Vahtera J, Marmot MG, Head J. Effects on blood pressure do not explain the association between organizational justice and coronary heart disease in the Whitehall II Study. *Psychosom Med* 2008; 70(1):1-6.
21. Gimeno D, Tabák AG, Ferrie JE, Shipley MJ, De Vogli R, Elovainio M, Vahtera J, Marmot MG, Kivimäki M. Justice at work and metabolic syndrome: the Whitehall II study. *Occup Environ Med* 2010; 67(4):256-262.
22. Varga T V, Xu T, Kivimäki M, Mehta AJ, Rugulies R, Rod NH. Organizational justice and long-term metabolic trajectories: a 25-year follow-up of the Whitehall II Cohort. *J Clin Endocrinol Metab* 2022; 107(2):398-409.
23. Elovainio M, Leino-Arjas P, Vahtera J, Kivimäki M. Justice at work and cardiovascular mortality: a prospective cohort study. *J Psychosom Res* 2006; 61(2):271-274.
24. Inoue A, Kawakami N, Eguchi H, Miyaki K, Tsutsumi A. Organizational justice and physiological coronary heart disease risk factors in japanese employees: a cross-sectional study. *Int J Behav Med* 2015; 22(6):775-785.
25. Rineer JR, Truxillo DM, Bodner TE, Hammer LB, Kraner MA. The moderating effect of perceived organizational support on the relationships between organizational justice and objective measures of cardiovascular health. *Eur J Work Organ Psychol* 2017; 26(3):399-410.
26. Price J, Mueller C. Distributive justice. In: Price J, editor. *Handbook of organizational measurement*. Marshfield: Pitman; 1986. p. 122-127.
27. Xu T, Clark AJ, Pentti J, Rugulies R, Lange T, Vahtera J, Magnusson Hanson LL, Westerlund H, Kivimäki M, Rod NH. Characteristics of workplace psychosocial resources and risk of diabetes: a prospective cohort study. *Diabetes Care* 2021; 45(1):59-66.
28. Kivimäki M, Virtanen M, Elovainio M, Kouvonen A, Väänänen A, Vahtera J. Work stress in the etiology of coronary heart disease – a meta-analysis. *Scand J Work Environ Health* 2006; 32(6): 431-442.
29. Gimeno D, Tabák AG, Ferrie JE, Shipley MJ, De Vogli R, Elovainio M, Vahtera J, Marmot MG, Kivimäki M. Justice at work and metabolic syndrome: the Whitehall II study. *Occup Environ Med* 2010; 67(4):256-262.
30. Sheeraz MI, Ungku Ahmad UN, Ishaq MI, Sarfraz M, Md Nor K. The research on organizational justice in Scopus indexed journals: a bibliometric analysis of seven decades. *Front Psychol* 2021; 12; 647845.

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