

Overview of the “Gender & Work” track at the IEA 2021 congress

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Received 26 August 2021

Accepted 12 March 2022

Abstract.

BACKGROUND: The International Ergonomics Association (IEA) is an international federation of associations created in 1959, whose mission is to extend the scope of ergonomics research and intervention to all spheres of society in order to improve human well-being.

OBJECTIVE: This article presents an overview of the main research papers that were presented at the 21st Triennial IEA 2021 Conference.

METHOD: A total of 23 talks, from nine countries, were presented over four sessions. These papers were summarized based on reading the abstracts and taking notes at the time of the oral presentation.

RESULTS: The themes of these sessions were: 1) Knowledge Transfer, Gender and Ergonomics 2) Approaching Ergonomic Interventions with a Sex/Gender Lens: Designing Training for Ergonomists 3) Ergonomic Studies of Atypical Work and Vulnerable Population Through a Sex/Gender Lens: Toward Better Understanding of Context and Risks, for Better Prevention and 4) Gender and Occupational Risks (Part 1 : Exposure and Risk Perception; Part 2 : Strategies to Manage Risk).

CONCLUSION: Ergonomists are beginning to understand that they have the qualifications and legitimacy to play a role in reducing workplace health inequities and helping to make workplaces inclusive and rich of all the workers' diversity. The four sessions of the Gender and Ergonomics TC have moved ergonomics practice a step closer to that goal.

Keywords: Ergonomics, knowledge transfer, sex/gender-based analysis

1. Introduction

The International Ergonomics Association (IEA) is an international federation of associations created in 1959, whose mission is to extend the scope of ergonomics research and intervention to all spheres of society in order to improve human well-being. The IEA's governance structure includes 27 thematic

technical committees, one of which focuses on the understanding of sex and gender dimensions in ergonomics research and intervention: the *Gender & Work Technical Committee* (TC). (Note that the TC's current and past chairs are among the authors of the present communication.) This TC fosters production and dissemination of knowledge on the interactions among gender, sex, work environment, working conditions, work activity, well-being and productivity in order to favor equal access of women and men to economic, physical and psychological well-being at work.

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During the 2021 IEA congress, the *Gender & Work Technical Committee* organized four sessions: 1) Knowledge Transfer, Gender and Ergonomics, 2) Approaching Ergonomic Interventions with a Sex/Gender Lens: Designing Training for Ergonomists, 3) Ergonomic Studies of Atypical Work and Vulnerable Populations with a Sex/Gender Lens: Toward Better Understanding of Context and Risks, for Better Prevention, and 4) Gender and Occupational Risks (Part 1 : Exposure and Risk Perception; Part 2 : Strategies to Manage Risk). These sessions addressed how to integrate sex and gender into ergonomics research and interventions, including reflections on knowledge translation. The contributions came from nine countries: Canada (14), France (2), Chile (1), Colombia (1), Italy (1), Lebanon (1), Portugal (1), Sweden (1), and Switzerland (1).

According to the definition by Johnson et al. [1], applied to the field of occupational health, “sex” refers to biological and physiological characteristics of male and female workers, while “gender” refers to the gendering of work through social mechanisms. Note that since sex and gender interact to produce workplace phenomena, from acceptable weights to work/family articulation, we will not attempt to separate them and will refer here to “sex/gender” (s/g). Sex/gender considerations are important and relevant to ergonomics since occupational health is shaped by s/g at many levels [2–4], as was amply demonstrated during the sessions.

The objective of this article is to synthesize the content and discussions that took place during the *Gender and Work* TC sessions. Each of the following sections describes a session, including a general description of the session, a summary of the formal presentations (as we understood them), and the main themes of discussion. During some sessions, the discussion went further than the individual presentations and brought up points of more general interest. We present summaries of those interactions below.

2. The Session “Knowledge Transfer, Gender, and Ergonomics”

To ensure that the specific characteristics of men and women are taken into account, many countries have adopted a Gender-Based Analysis plus (GBA+) approach. GBA+ is an analytical process used to assess how diverse groups of women, men and non-binary people may experience policies, programs, and initiatives (here, ergonomics research and inter-

vention). The “plus” in GBA+ acknowledges that GBA goes beyond biological (sex) and socio-cultural (gender) differences to consider other identity factors, like race, ethnicity, religion, age, and mental or physical disability.

Knowledge transfer requires consideration of the nature of the audience [5]. This session was intended to stimulate reflection on approaches to knowledge transfer and accurate dissemination of results, keeping in mind the considerable diversity of audiences concerned with occupational health research. Ergonomics research projects and interventions in occupational health are often initiated in response to a request from the communities concerned, be they businesses, unions, or other interested groups. This starting point for intervention is an opportunity to pool scientific with practical knowledge in order to reduce the burden of work in a given sector (e.g., the healthcare sector) or to help handle a sensitive issue. It is useful to refer here to “integrated knowledge transfer” (iKT) [5]. The iKT paradigm refers to the production, sharing, and/or use of knowledge resulting from a collaborative, partner-led scientific initiative.

The contributions in this session discussed approaches and methods to foster knowledge transfer initiatives in ergonomic interventions in order to improve the consideration of sex and gender.

Rima Habib presented a scoping review identifying the most recent (2019–2020) approaches in the integration of gender in the literature on healthcare workers in conflict settings [6]. Despite the publication of a previous review highlighting inadequate consideration of gender, the authors found similar gaps in the subsequent literature on such healthcare workers. The results highlight obstacles to the inclusion of gender considerations, and a need to strengthen the efforts to encourage gender integration in occupational health research. The authors conclude that there is a need for more comprehensive tools and strategies to improve the integration and evaluation of gender in research and support gender-sensitive, evidence-based policies and practices. During the discussion, the participants expressed surprise that more than half the studies of healthcare workers covered primarily male populations. As a result, it was nearly impossible to observe the issues faced by female healthcare workers in conflict settings. Those present agreed that listening to groups of female and male healthcare workers both together and separately would be important for future studies and research.

Hélène Sultan-Taïeb and her collaborators also presented the results of a scoping review [7]. Their aim was to identify existing guidelines intended for researchers, providing recommendations on how to take account of s/g issues in public health with a focus on occupational and environmental health. The 19 references identified through a systematic search of peer-reviewed articles and in the “grey” literature came primarily from the general public health field, with only three references in occupational health. Qualitative analysis of the literature highlighted gaps [7]. For instance, there is room for contributions on how researchers and partners should take account of causes of gender inequity within the partnership process and not only in the research object. Sultan-Taïeb and coll. urged that precautions need to be taken during occupational health interventions, especially when discussing the causes of gender inequity, so as not to encourage stereotypic thinking about workers’ abilities and aptitudes. Such discussions with partners are fraught with difficulties and may even threaten the existence of the partnership. This scoping review also found that the occupational health references did not provide recommendations related to reflexivity (whose voice is represented in results, how decisions are made, what are the gender power issues within a given partnership) and did not explicitly encompass issues related to cumulative forms of oppression (gender, ethnicity, age, class, etc.) contrary to the conclusions from literature in environmental and public health. Further investigations would be useful to determine whether these guidelines about reflexive processes could be transferred to occupational health PR projects and contribute to a better integration of s/g issues, especially where partners (such as employers) are reluctant to accept this type of analysis.

During the discussion period, attendees confirmed their need for tools, guidelines, and networks enabling researchers, ergonomic practitioners, and clinicians to make s/g analysis when performing ergonomic analyses in the workplace. They also commented on the paucity of the literature, since only 19 references could be included in the scoping review.

Véronique Poupart-Monette presented the findings of a qualitative study exploring perspectives of both stakeholders and researchers involved in occupational health intervention-research (IR) studies about the facilitators and obstacles to considering sex and gender, from the early stages of research to publication of results [8]. Interviews were conducted with researchers and partners involved in seven Cana-

dian occupational health IR projects integrating sex or gender considerations to different degrees. The interviews were transcribed, and a qualitative content analysis was done. According to researchers and partners, the projects varied in the degree to which they addressed s/g issues head on, in researchers’ personal interest in s/g questions, in the complexity of s/g issues, and in the socio-political context. Partners found that a positive relationship with the research team and an initial interest of the specific workplace for the s/g aspect of the project made the research and intervention process easier. Facilitators and obstacles may differ from one context to another, and it is mandatory for researchers and partners to consider the characteristics of the community in which the intervention takes place, as well as its sensitivity to s/g issues, in order to minimize resistance. During the discussion, Poupart-Monette identified resistance to addressing sex and gender issues, such as partners being unaware of gender-based discrimination and decision makers lacking consideration for these issues even once presented with results, as a critical area for future studies.

Work-related musculoskeletal disorder (WMSD) prevention is a public health priority in Quebec, Canada. As part of prevention, teams of physicians, nurses, hygienists, and ergonomists at the Quebec Institute of Public Health developed an algorithm and tools to assess work demands [9]. These teams visit worksites throughout Quebec to identify health hazards and assist workplaces in implementing preventive interventions. However, the teams have not adopted a GBA+ approach. Susan Stock’s presentation highlighted some s/g differences in the organizational context and social environment of work and described strategies to consider these elements during ergonomic interventions to prevent musculoskeletal disorders (MSDs) [10]. She described tools developed recently to take into account workplace organisational context and social environment during ergonomic interventions and how they may be adapted to take s/g into consideration. Stock intends to develop knowledge translation so that what is being learned in s/g research can be applied in the field in practical ways. During the discussion, a participant stressed that it was often challenging to explain that repetitive static postures, common in women’s jobs, are just as damaging as the more visible heavy work usually assigned to men. Stock agreed that strong epidemiologic evidence supports this interpretation and hence, educational activities for managers, engineers, etc. based on lon-

gitudinal studies are certainly a way to sensitize these practitioners to such less visible risks.

Attendees concluded with strong suggestions that the IEA develop a code of ethics for ergonomic practitioners which would include attention to demographic characteristics such as s/g, immigrant status and racialization.

3. The Session "Approaching Ergonomic Interventions with A Sex/Gender Lens: Designing Training for Ergonomists"

Consideration of s/g is important and relevant to ergonomics since occupational health is shaped by sex/gender at many levels [4]. Sex and gender influence working conditions, work activity and health effects. Taking s/g into consideration contributes to understanding work activity and is therefore a step toward health equity and social justice in occupational health and safety. For this reason, it is important to integrate a s/g approach when training ergonomists.

Women are a clear majority of workers in several industrial sectors, including healthcare, education, and retail sales. In Quebec for instance, these sectors are currently excluded from most of the prevention measures in the occupational health and safety law, although 86% of women compensated for musculoskeletal disorders work in those sectors [11]. Researchers have also noticed that women are less often included in testing safety and protective equipment [12–14]. In this session, the presentations addressed how an ergonomist can participate in debates about s/g issues around law, equity, justice, and health problems in workplaces. This special session, composed of five presentations, was intended to lead participants to think about the best approaches to increase the ability and the capacity of ergonomists to appropriately include s/g considerations in ergonomics research and interventions.

The presentations proposed a panoply of issues that ergonomists should consider when starting an intervention at the request of a company, a union, or a third party (e.g., workers' compensation boards, associations). The question of whether and how the ergonomist should disclose this s/g lens to the requesting organization was addressed.

Vanessa Blanchette-Luong began this session with a review of methods used to integrate s/g in IR projects [15]. The findings are based on a retrospective analysis of twelve IR projects in occupational

health carried out by researchers in ergonomics (11) and anthropology (1). The results show a variety of methods used to integrate s/g throughout the phases of the project. This analysis led researchers to reflect on such issues as the way to address s/g with partners, workers, and others involved in the project and the limits and advantages of a range of methodological tools. Blanchette-Luong and her colleagues concluded that the methods used, and their effectiveness, seem to be influenced by the context in which the IR takes place and that further analyses are needed to inform researchers on the contextual elements that influence the choice and effectiveness of methods used to integrate s/g.

Three presentations, introduced by Martin Chadoin, described various aspects of a study concerning the introduction of s/g considerations during internships of five students during the final year of their M. Sc. Ergonomics program [16–18]. The students carried out interventions at the request of employers and received, in addition to their usual training and supervision, two lectures on s/g integration in ergonomics, given by a professor who was not part of the usual teaching staff [16].

Marion Inigo presented the content of the training sessions and their evaluation by students [17]. Three categories for potential s/g inclusion in an ergonomics intervention were taught: 1) investigating and modeling work activity while integrating s/g; 2) implementing solutions including consideration of s/g; 3) exchanging with stakeholders on s/g issues. The evaluations were mixed. Although students reported feeling satisfied with this training and considering it useful for ergonomics practice, they perceived some obstacles to integration of s/g in their interventions and did not feel they had sufficiently integrated s/g. The results nevertheless support to some extent the idea that improving knowledge around s/g could be a lever for more inclusive and health-centered ergonomics interventions.

Marie Laberge situated the study in relation to the field of work activity ergonomics [18]. Ergonomists trained in this tradition have long argued that ergonomic interventions should not target individual characteristics (such as s/g), but rather work situations and the interface between workers and their environment. Also, some of the regular teaching staff reacted negatively to what they perceived as a feminist approach in the training. They believed that a feminist view was a personal value that should not be required of students rather than a posture enabling ergonomists to reinforce equity and social justice.

Presenters argued that, far from being a personal or political position, *s/g* analysis is relevant to ergonomics because gendered socialization is pervasive in workplace settings and contributes to a division of the labour market, as well as to gendered exposures to working conditions and their consequently different health effects for men and women [16–18]. In addition, physical and anatomic differences between women and men interact with worksite and equipment design and are thus relevant to exposures. Thus, once ergonomists consider sex/gender as a determinant of work situations (assignment of tasks/roles, adaptation of equipment and work spaces, power relationships, gendered subcultures, harassment/bullying/ordinary violence, etc.) rather than an individual characteristic, it becomes highly relevant to work activity analysis [19]. A global analysis of the incorporation of *s/g* during the internships concluded that introducing this new training material during the already dense and challenging first attempt at intervention held too many layers of complexity for trainees to assimilate and apply it efficiently and consistently. Reflexive tools introducing students to *s/g* analysis should therefore be furnished much earlier during their formal training. After graduating, new ergonomists should continue the learning process through mentorship, continuing education, or even by obtaining a gender-based analysis certification. This type of expertise could well interest employers seeking to improve equity and diversity generally.

The final presentation, by Karen Messing, compared two approaches directed toward overcoming obstacles to integrating *s/g* in ergonomic intervention [20]. Ergonomists can play a visible or a more subtle role in transforming these situations. One group of ergonomists declared the importance of having a clear *s/g* analytical lens, while the other included it informally as a “best practice” without highlighting it to the workplace participants. The first approach was more likely to contribute to broader social change, but the second, less often contested, might be more helpful to the specific workplaces involved.

For this session, the general discussion originally focussed on the fact that neither employers nor workers are at ease with the idea of introducing a *s/g* analysis although it is an important lever to improve health and safety performance. Performance may be represented in terms of economic profit, but it should also include the impacts on the community and on the environment.

The discussion also touched on the fact that sex/gender issues can be very hard to capture as well as being very difficult to discuss with stakeholders. Ergonomists must bring up *s/g* issues in the most skillful and strategic fashion if they want employers and workers to take them into account. They must also ask themselves why there is such reluctance to include *s/g* in interventions? Is there in fact a risk that introducing *s/g* considerations will sidetrack discussions and thereby impede efforts to improve local working conditions? Ergonomists may generally have trouble addressing sensitive issues in the workplace, especially with the significant time constraints on discussions with and among workers and managers. Thus, ergonomists need to make explicit links between *s/g* and improving workers’ health and performance in order to overcome this problem.

Furthermore, the intersection between gender and other social constructs (such as race) should be made visible, given that, for instance, women of color may experience more inequity and prejudice than white women or men. It was proposed that IEA develop a code of ethics requiring ergonomists to consider *s/g* (and other identity factors) when performing an ergonomic analysis of the workplace. This would allow them to do a *s/g* analysis (for example) without having to plead for *s/g* consideration, thus enabling them to improve workers’ health for all as well as company performance.

During the discussion, a question was raised regarding the relevance of including a specific validation of results with gender or racially uniform groups. It was suggested that, during preliminary investigations, it might be relevant to have a phase during which female groups and male groups were separated. This could facilitate the free expression of workers concerning *s/g* issues in their workplace. A second phase could ensure that male and female workers could learn how to talk about those issues together and be made aware of each others’ concerns.

4. The Session “Ergonomic Studies of Atypical Work and Vulnerable Populations Through a Sex/Gender Lens”

Atypical and non-standard employment settings (e.g., part-time, short-term, temporary, self-employed or multiple jobs, telework, seasonal work, intermittent, variable and unpredictable hours, work for a temporary employment agency) have become extremely common [21, 22]. These types of employ-

ment relationships open the way to difficult working conditions since wages are often lower, and access to social protection systems, union representation and collective bargaining are drastically decreased [23]. Professions, jobs, and work have always been gendered, and atypical jobs held by women and men do not involve the same constraints in terms of salary and access to social rights [23]. While men are more likely to be found in seasonal work, women more often hold temporary, part-time jobs, with atypical hours and sometimes multiple employers. Such precarious working conditions affect occupational health and safety [24]. On the other hand, research shows that flexible schedules and part-time work can be, when voluntary, a resource for balancing work and family [25].

Mélanie Lefrançois and Mélanie Trottier introduced the session with a presentation focusing on work-family balance (WFB) issues in the construction industry, a topic that has rarely been studied [26, 27]. Atypical and inflexible schedules, seasonal work and s/g division of labour create challenging conditions for parents working in this male-dominated industry. This participatory action-research project was initiated by non-academic partners confronted by challenges to attract/retain women in the industry during a labor shortage. Lefrançois and Trottier collected qualitative and quantitative data with on-site workers (20 interviews and 789 completed surveys) to understand the work-family interface: issues, strategies, determinants and consequences including gendered dimensions [28]. Results showed that high levels of work-family difficulties have a similar impact on men and women in terms of physical and mental health. However, at the organizational level, men experiencing more family interference with work were more inclined to leave the industry whereas women in similar situations more frequently intended to stay with their employer. Also, while many men reported focusing on work as a means to provide for their family, female construction workers were principally responsible for the domestic sphere. Gendered differences in work exposures and work-family strategies were also identified to inform avenues to transform workplace cultures more equitably. More specifically, encouraging managerial support for work-family issues would legitimate fathers’ willingness to be involved with their family as well as working mothers’ place in the industry.

Myriam Bérubé presented an innovative approach to analysis and design in the development of a new technology-supported work injury management

system (TWIMS). She explained how an interdisciplinary approach makes it possible to combine analysis of work activity, “agile” technological design techniques and sex/gender-sensitive analysis for prevention of occupational injuries in vulnerable populations, such as atypical workers [29]. The Work-Oriented Training Path (WOTP) is a Quebec (Canada) school program helping people aged 15 to 21 to develop their employability by alternating between school and internships. Among other tasks, teachers in this program must ensure that students are healthy and safe in their work environment. The research team is developing technological tools to reinforce the teachers’ role in health and safety and has started by analysing the work of WOTP teachers, which is complex and modulated by several determinants. Technological evolution will change this activity in a way that can be anticipated through the Future Activity Approach. In order to ensure that young people with learning difficulties develop prevention skills specific to their gender-segregated jobs, tools must also consider the influence of s/g. One challenge is that GBA+ is a reflexive posture; there are no specific steps to follow, just general principles. The emphasis in GBA+ training is to become familiar with the concepts surrounding s/g and other sources of diversity, so as to be able to recognize such phenomena as discrimination and power dynamics in the workplace. This poses a challenge since it is difficult to explain to someone succinctly what it means to use this analytical approach (e.g. Agile design team). Since the Agile approach does not itself explicitly require knowledge of the concepts of s/g discrimination, gender identity, and so forth, those concepts could easily be ignored during the process. Therefore, Bérubé and her team are currently interested in establishing a common language, and ultimately, in possibly setting up a specific training program.

Marie Laberge presented an application of Bérubé’s approach. In addition to s/g issues, she focussed on the ergonomics research project during which the system will be developed and especially on the request for intervention, the work environment in which the research takes place and the population involved. This presentation described, through a s/g lens, occupational health and safety (OHS) activities carried out by stakeholders involved in the WOTP, and documented their need for new technological OHS resources [30]. The research team used multiple data sources to collect the opinions of four school principals (2 women – 2 men), 12 teachers (8 women – 4 men), and 126 students. School principals

mentioned that they have limited access to students’ day-to-day OHS considerations, despite acknowledging that they have some responsibilities in this regard. Teachers expressed feeling personally concerned by OHS, but they focused mainly on students’ attitudes and behaviors. Male teachers seemed more proactive in involving companies in prevention with their students. Students were able to identify several hazards in their traineeship workplaces. Male students tended to name a larger number of potential dangers, but only women named stress and anxiety as specific hazards. Men usually reported receiving more OHS training than women, throughout their traineeships.

Marianna Macedo presented a study about the sexual division of labour and the invisible risks associated with automation in the wine bottle cork industry in Portugal [31]. The study presents findings based on fieldwork carried out in two Portuguese cork processing companies. Men and women perform very different tasks in this industry. Men hold jobs demanding explosive strength, such as perforating cork strips, whereas women perform cognitively demanding activities like the inspection of corks for quality. Consequently, men reported having more MSDs while women reported feeling more mental fatigue. The women are also exposed to respiratory illness when they breathe in micro-organisms contaminating the cork. Manual cork drilling (performed by men) has not yet been automated, but cork selection (performed by women) is being transferred to machines. Recently, the industry has been automated, and the women’s knowledge is being used to “train” machines to sort the corks by quality. Despite these changes, health risks remain in the women’s jobs. The presentation situated the evolution of women’s work in relation to the region where they live, whose development has been closely linked to that of the cork industry. The presentation addressed the evolution of a traditional occupational segmentation by gender and explored whether automation poses unknown risks for women workers, and for other occupants of the territory.

Marie-Eve Major presented a portrait of published interventions aimed at preventing MSDs in the atypical work context of seasonal work, examining how sex and/or gender are integrated in those interventions [32]. Many industry sectors that involve a large proportion of seasonal workers are characterized by working conditions that are demanding from a musculoskeletal perspective and by a gendered and sex-based division of labor. There was no mention of s/g of the participants in the literature analyzed, mak-

ing it difficult to analyze differences between MSDs among male and female workers. The study illustrates the need to address occupational health inequalities in a seasonal work context in order to better design interventions for this underserved and understudied population.

The session concluded with a general discussion of how to approach work-related MSDs from a gender perspective. It was suggested that it is now more useful to examine gendered exposures than gendered outcomes, since little is known about sex differences in the mechanisms involved in musculoskeletal pain induction.

Participants asked whether any research had been done on non-binary and other gender minorities and work. It was mentioned that, during one study, a student was transitioning from female to male, and the stakeholders involved in the study found the situation challenging. The research team felt that bias influenced the interpretation of data from this student but was unable specifically to remedy this.

5. The Session “Gender and Occupational Risks”

Occupational health data show that women and men face different risks, even when they work in the same jobs, professions, and employment sectors. Is this result attributable to sex (biological and physiological differences) or to gender (social roles, power relationships, norms, and expected behaviors)?

It is known that women and men hold different jobs, and this division of labour may explain a part of the observed differences in exposures. There is also a division of tasks within jobs and companies, which may further explain the different occupational health and safety risks. Women, for example, are reportedly more exposed to musculoskeletal disorders and psychosocial risks, because they are more often asked to do repetitive tasks and to work with the public. Men, on the other hand, are more exposed to safety hazards, for example in construction or manual materials handling.

Is the perception of risks different in a predominantly male or female environment? Are chemical exposures the same for both (and if so, do the two sexes metabolize hazardous substances in the same way)? What is the influence of sex and/or gender on exposures that lead to occupational cancers? For the same job, work activity can differ according to sex-related variables such as size, strength,

and endurance. Gender can influence the capacity to manage risks in one's work through level of responsibility, social interactions, and work organisation. The work/health relationship should be addressed, from a gender perspective in terms of risk-taking attitudes, work/life balance, career paths and work activity process.

Due to the number of authors in this session, it was divided into two parts. The first part included communications on exposures and risk perception (3 presentations) and the second part included papers on risk management strategies and risk analysis methods (5 presentations). The main themes of this session covered topics such as:

- Analysis of disaggregated epidemiological data on risk factors affecting women or men in relation to all types of occupational health and safety risks.
- Interventions aimed at reducing risk factors in predominantly male, female, or mixed sectors.
- Subpopulations vulnerable to specific risk factors via links to sex or gender.
- Suggestion of new approaches to ergonomic intervention.
- Risk analysis with a sex/gender sensitive approach.
- Exposures due to unequal social relations or roles at work.
- Exposures that affect a female or male minority in sectors occupied by a majority of the opposite sex.
- Scientific knowledge of the physiological, biomechanical, or social mechanisms underlying associations of sex or gender with hazards.

Jean-Philippe Morin presented a study that measured the vagal response to exposure to a dynamic workstation that moved between sitting and standing heights for different regular durations and documented sex-related responses [33]. Fourteen workers who work normally with computers (seven women and seven men of working age) were exposed to a dynamic workstation in their everyday office work environment. Heart rate variability (HRV) was used to measure the vagal activity, and questionnaires measured musculoskeletal health. Generally, sex differences in vagal responses were found, but results were not consistent across age groups. Indicators of overall physiological response to a dynamic workstation appear to be related to sex among a cohort of experienced office workers, where women showed a higher vagal response than men, and men had a

decrease in the number of body regions with reported musculoskeletal discomfort. More attention should be given to sex-specific responses to a dynamic workstation.

Pamela Astudillo and Carlos Ibarra compared women's and men's working conditions in schools in Chile during the pandemic using an ergonomic approach [34]. The research team sought to gather evidence on which to base public policy decisions that could benefit workers in this sector. They found statistically significant gender differences in access to a private workspace without annoyances and interruptions, with 37.9% of men and 64.4% of women lacking such access. In particular, differences were found in: adjustable chair height; armrests with adjustable height; notebook boost; access to a wireless mouse; adjustable screen; access to microphone with headphones, among others. Unsurprisingly, 91.7% of women and 82.8% of men reported discomfort after a telework shift. Significant gender differences were observed for muscle aches (neck, shoulders, elbows, back, etc.), headache, and irritation or sore throat [34]. The authors add that in Chile, no sex/gender differences in the threshold for scoring are applied to the mental health questions on the General Health Questionnaire, and the prevalence of work-related mental health pathology was higher for women. However, women's claims for work-related musculoskeletal problems are rejected more often than men's, as has also been reported in Canada and Sweden [35, 36].

Svend Erik Mathiassen presented a study aimed at describing proportions of time sitting, standing, and moving among women and men during grocery store work, which has not previously been documented [37, 38]. In addition, Mathiassen and his team aimed at determining the extent to which possible differences in movement between genders could be explained by a gendered distribution of work tasks. Accelerometry measurements of postures of 37 grocery store workers showed that the average worker spent about 50% of the work time standing, about 30% sitting, and about 20% moving. Female workers sat a little more and stood less than their male colleagues, a difference explained to a large extent by a gendered distribution of work tasks. While time spent sitting, standing and moving may not be critical to health for the average worker, and time spent moving may even be beneficial, the gendered structure of work activity was remarkable. Assessments of sedentary behavior and physical activity in occupational groups are needed to understand the eventual

effects of interventions aiming at health issues related to these behaviors, such as cardiovascular disorders (associated with too much sitting) and low-back pain (too much static standing). Even when assigned to the same job title, men and women may have different work tasks and physical workloads [39], which may, to some extent, explain why women suffer more from occupational musculoskeletal disorders than men. Studies of health-related behaviors should therefore include observations of gendered working condition.

Participants asked Mathiassen to share his view on gendered allocation of work in Sweden as well as across countries. He shared that, during their study, shop managers were asked about equality issues. They consistently answered that there were no differences in what men and women workers did nor in the way they were treated, since shop managers said they were truly focused on equality. However, when interviewed more closely by the gender researchers on the project, there were indeed attitudes that were clearly gendered. Thus, Mathiassen stated that Sweden may be a front runner when it comes to gender equality, but it seemingly is not there yet. As far as gendered task allocation across countries, he believes it would be difficult to discern whether, for instance, cashiers’ postures in shops in different countries have shown similar differences between men and women workers, simply because the social factors surrounding the shops make an immense difference.

The arrival of women in a profession previously occupied by men can lead to questions about the approaches built into professional training and learning. Women must devise strategies to achieve recognition. Understanding women’s work activity can provide insight into risk management in the high-risk professions, such as that of mountain guides. Sandrine Caroly’s presentation described a study that questioned ergonomic methodologies in order to explore women’s relationship to risk in a male-dominated work environment [40]. The researchers suggested that when a profession is just beginning to include women (only 2% of high mountain guides are women), it is not useful to compare men and women. This is because there are not enough women for ergonomists to select representative situations and describing isolated individual situations can contribute to gender stereotyping, making gender action-research difficult. Hence, to address the question of how women manage risks in a high-risk, predominantly male profession, the researchers proposed to start with a detailed work activity analysis, and then to examine the strategies the women use to

build a strong professional identity in a male profession.

As part of a gender-based research project aimed at documenting the collective dimension of work in vocational training, Jessica Riel and her colleagues conducted individual and collective interviews with 30 vocational training teachers [41]. Qualitative analysis showed that the professional skills required for teaching in predominantly female trades seem to be less often recognized by directors of vocational training centers than those required for teaching in male-dominated trades. This inequality affects interactions among teachers and therefore the functioning of the work collective. Riel’s presentation revealed that gender affects teachers’ work activity by reducing the operational leeway that allows them to establish consistency in teaching and student assessments, contributing to psychosocial risks [41]. One suggestion for improvement came from the observation that the work of other teachers was negatively affected when a new teacher was hired without having the proper experience to teach the program, which, in turn, affected the functioning of the entire work collective. To avoid this outcome, teachers wished to be consulted during the hiring process. They also expressed a need for more allocation of time to discuss their work among themselves.

Switzerland’s Labour Law and its Maternity Protection Ordinance (OProMa) aim to protect the health of pregnant employees and their future children while enabling workers to continue their professional activities. Contrary to other occupational health issues, the aim of “gender neutrality” does not apply to maternity protection, which cannot disregard male-female biological differences [42]. Isabelle Probst reported her research team’s analysis of the experience of workers regarding maternity protection policies, with respect to health protection, pregnancy-work articulation, and gender discrimination [43]. Occupational health policies targeting pregnant women have been criticized for exacerbating gender inequalities, by implying that becoming a mother is incompatible with professional requirements. However, some authors argue that it is possible to seek gender equality while recognising the biological specificities of men and women at work. Institutions that anticipate pregnancies can ensure that other workers are not overloaded by the care taken to protect pregnant women. Planning policy for maternity/pregnancy leave makes it possible for companies to evaluate beforehand what work accommodations or reassignments are possible in the hospital or service.

Moreover, maternity protection policies may focus public and scientific attention on women's health at work, the risks of which are often forgotten [3, 44]. For example, pregnant workers in cancer care may be exposed directly to carcinogenic chemotherapy medications or to patients who excrete them. But even though pregnant women get protection once they announce their pregnancy, working in a chemotherapy ward remains very dangerous for women not yet aware they are pregnant or those who chose not to disclose it immediately, as well as, to a lesser extent, for all workers.

Safety rules regarding chemical risks are usually derived from laboratory research and established for an average man. In addition, the focus of such standards is to prevent specific risks, one by one, and not to design overall safe situations at work. This approach limits the value of the standards and prevention strategies for real-world work situations and does not include gender-adapted safety strategies, even where necessary. As part of a research-intervention project on occupational chemical risk prevention, Fabienne Goutille and her colleagues showed how an ergotoxicological approach, linking toxicology and ergonomics, makes it possible to consider the enlargement of strategies to design safe ways to work in toxic environments [45]. This presentation focused, in a gendered manner, on the strategies developed by workers to adapt safety rules and work situations according to the characteristics of the workers and their various levels of risk of exposure to chemicals.

Silvana Salerno presented a study of gender differences in non-vehicle work injuries, including five years of data (2014-2018) from Italian compensation records. The source of data was INAIL (National Institute for Insurance against Injuries at work) Data Records [46]. Results showed that upper limb injuries in general occurred more often among men than women, with hands most often injured. However, wrist and elbow injuries were significantly more frequent among women than among men. Women reported a higher proportion of injuries involving wrist fractures in cleaning, wrist dislocation in healthcare and wrist bruises in post-service activities. Women's lower limb injury rate was higher than men's in healthcare activities, cleaning, and transport. Among women, knee injuries and ankle dislocation occurred among cleaners and postal service workers, and knee bruising among those involved in healthcare. Hypotheses are discussed that could explain the high rate of wear and tear of wrists, elbows, ankles, and knees among women compared to men in a sub-

sample of 92% of women's professions, taking s/g differences in biology and in working postures into account.

During the discussion period, panelists were asked if they had ever encountered any forms of resistance from workplaces, funding agencies, partners or workers when presenting s/g specific results. Silvana Salerno explained that in Italy, to access s/g separated data from public agencies is very difficult and researchers must fight for it.

Finally, participants asked the panel how to overcome the 'macho' perception that men should not complain when encountering unacceptable work conditions. It was pointed out that this culture is very difficult to change. To overcome the challenge, an ergonomic intervention could allocate time for workers to discuss safety improvements based on their own strategies. More generally, it appears that people involved in unions develop a greater awareness and sensitivity to risks in the workplace.

6. Overall Conclusions from the Symposium

The *Gender & Work Technical Committee* was created following the 2006 IEA congress. It is clear that the popularity of this TC has been growing since its creation. With nearly sixty member delegates from fifteen different countries, the consideration of sex and gender in ergonomics interventions appears to be of increasing concern for ergonomists. In fact, systemic inequities that confine certain subpopulations to more difficult or less valued working conditions on the basis of their gender or other identity factors, such as race, age or disability, are now better known and strongly criticized. Ergonomists are beginning to understand that they have the qualifications and legitimacy to play a role in reducing workplace health inequities and helping to make workplaces inclusive and rich of all the workers' diversity. The four sessions of the Gender and Ergonomics TC have moved ergonomics practice a step closer to that goal. This experience shows that gender considerations can take on a wide variety of forms, even within the field of ergonomics. Methods must be developed and refined to improve practice in this regard. Finally it should be noted that Laberge and Caroly [47] suggest that an additional transversal competency be added to ergonomics training. Competence in EDI (equity, diversity and inclusion) should be included in ergonomics curricula. The present authors would suggest that such training include both theoret-

ical (anatomical and physiological differences, power relations in the workplace) and practical (how and where to make suggestions for change) considerations.

Ethical approval

Not applicable.

Informed consent

Not applicable.

Conflict of interest

The authors report no conflicts of interest.

Acknowledgments

The communication summarized in this paper were all presented at the 2021 triennial conference of the International Ergonomics Association (IEA) held virtually in Vancouver, Canada, with financial support from the Social Sciences and Humanities Research Council of Canada (SSHRC) (Connexion initiative # 611-2020-0240). The authors would like to thank the entire “GESTE for knowledge translation” team and “SAGE” team in Quebec, several of whose members participated in the “Gender & Work” sessions (the GESTE team is funded by the Canadian Institutes of Health Research # 153464; the SAGE team is funded by the Fonds de recherche du Québec – Société et culture # 2021-SE3-284320). Finally, we warmly thank the “Gender & Work” Technical Committee of the IEA who organized the sessions described in this paper, as well as the presenters.

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