Development and application of an innovative instrument to assess work environment factors for injury prevention in the food service industry

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Abstract.

BACKGROUND: With the growth the food service industry and associated high injury and illness rates, there is a need to assess workplace factors that contribute to injury prevention.

OBJECTIVE: The objective of this report is to describe the development, application, and utility of a new instrument to evaluate ergonomics and safety for food service workers.

METHODS: Starting with a similar tool developed for use in healthcare, a new tool was designed through a collaborative, participatory process with the stakeholders from a collaborating food service company. The new instrument enables the identification and assessment of key safety and health factors through a focused walkthrough of the physical work environment, and structured interviews exploring the organizational work environment. The researchers applied the instrument at 10 of the partnering company's worksites.

RESULTS: The instrument identified factors related to both the physical work environment and organizational and contextual environment (e.g., vendor-client relationships) impacting worker safety and health.

CONCLUSIONS: Modern assessment approaches should address both the physical and organizational aspects of the work environment, and consider the context complexities in which the worksites and the industry operate.

Keywords: Human factors, occupational safety and health, safety management, occupational injuries, musculoskeletal disorders, risk assessment, work organization

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1. Introduction

In the United States, the food preparation and service sector has a large and growing workforce. According to the 2018 Occupational Employment and Wages Survey, food preparation and serving-related occupations are comprised of 13.4 million workers – 9.2% of U.S. employment [1]. It is the lowest paid occupational group, with a median annual wage of about $23,000 [2]. In the U.S. food service industry, the workforce includes over 25% Hispanics [3], and less than 2% of the workforce are represented by a labor union [4].

The growth of the industry is accompanied by an increased need for protecting food service workers (FSWs) from occupational safety and health (OSH) risks and promoting their health and well-being. FSWs are exposed to a range of hazards and experience high rates of injury. For example, they are at high risk of musculoskeletal disorders (MSDs) from repetitive movements and awkward postures (e.g., bending, reaching) required in various food preparation and service tasks; lifting and carrying heavy items; pushing carts; and prolonged standing [5–10]. Ergonomic solutions to prevent MSDs and improve safety in general – such as adjustable kitchen worktables – are not always available [11]. FSWs also experience injuries from slips, trips, and falls [12, 13], and acute injuries such as cuts from knives and other sharp tools as well as burns from hot oil, surfaces, steam and food items [5, 10, 13]. In the U.S. food service industry, all of these hazards may be exacerbated by psychosocial and organizational working conditions such as time constraints, limited rest breaks, long work days and incidents of workplace violence [5, 9, 11, 14–18].

There is also a preponderance of temporary workers in this industry, who have increased risks to injury and ill-health. This is due to several potential reasons including economic fluctuations, ambiguity of responsibility for complying with safety and health standards, and limited safety training due to the brevity of their position in a particular company [19]. Increasingly, temporary workers are documented to have higher rates of workplace injuries [20]. In addition, the number of these workers is increasing in industries that quickly need to fill open positions, or replace workers who are out on leave.

The food service work environment is fast-paced and unpredictable, and the workforce in large multinational food service companies is often geographically dispersed over multiple worksites. In addition to the hierarchical management structure of the company, many smaller company worksites are within a vendor-client relationship with another organization, adding complexity to the overall OSH management and the specific physical and psychosocial working conditions that can affect worker safety, health, and well-being [21].

In addition to safety and health studies of FSWs cited above [5–10, 12–18], the National Institute for Occupational Safety and Health (NIOSH) – through its National Occupational Research Agenda (NORA) – has summarized safety and health-related training materials for the food service industry [9]. Specific safety assessment instruments and ergonomics checklists that can be used in variety of work settings and industries are available [22–25] and can address specific hazards (e.g., fire safety). However, few practical and easy-to-use assessment instruments to identify overall OSH factors and general areas to promote health and well-being are available for use in food service work environments, leaving a significant gap in information needed to design and direct interventions. This is an important gap to fill in relation to continuous improvement processes advocated for advancing Total Worker Health® [26, 27]. Most online OSH inspection tools across various industries can be cumbersome, complex and detailed [28], often requiring trained OSH professionals to use them or demanding too much time to complete and translate into corrective action. To protect FSWs from occupational injuries and illnesses and excess work-related stress, there is a need for practical, easy-to-use worksite assessment instruments to identify risk factors as well as positive practices within the physical work environment and how the work is organized (e.g., scheduling, break practices). This study allowed us to develop and test such an instrument in a large food service company that had a safety program in place.

Thus, this paper has two purposes: (1) to describe the collaborative development, application, and utility of an assessment instrument developed for food service organizations, that includes a structured site manager interview and a structured worksite walkthrough, and (2) to present key findings from the application of the assessment instrument in ten food service worksites. The instrument addressed safety and ergonomics in the physical work environment, and the interview additionally captured organizational factors of the work environment from the perspective of the site manager (e.g., work intensity, psychosocial work hazards).

2. Materials and methods

The Harvard T.H. Chan Center for Work, Health, & Well-being collaborated with a large multinational food service company on a four-year Proof-of-Concept (PoC) Trial study (the 'Workplace Organizational Health Study') to develop and test policies, programs, and practices to improve health, safety, and well-being of food service workers by modifying the conditions of work [29]. As part of this larger study, various methods of assessment and evaluation were used to identify working conditions that influence workers' safety, health and well-being. In August 2018, as part of the initial measures, the study conducted baseline safety and ergonomics assessments to identify both the physical and organizational work environment factors that impact worker safety and health [26]. The Harvard T.H. Chan School of Public Health Institutional Review Board (IRB) approved all assessment procedures of the study.

The first step in the study was to develop and implement a process that could be used by a food service company to assess safety and ergonomics related to the physical work environment. This assessment process was intended to complement information already collected by the company. The assessment consisted of an observational walkthrough of the workplace and an interview with the site manager. The walkthrough was guided by an assessment tool and the site manager interview guide was used to collect information about organizational programs, policies, and practices related to ergonomics and safety. The site manager interview was designed to help put the walkthrough assessment results into context and identify potential intervention targets. Together the two assessment components were integral in identifying work hazards present in the physical and organizational work environment [26].

2.1. Study setting and worksite sample

Assessments were conducted in ten of the food service company's worksites, each operated as a food service vendor within the context of a vendor-client environment, contracted by different corporate client organizations at each site. The worksites employed between 7 and 30 employees. Half of the worksites (5 of 10) had fewer than ten employees. Nine sites were located in Massachusetts, and one site was located in New Hampshire. Each worksite operates as a cafeteria and has an on-site manager responsible for the day-to-day operations. Safety coordinators

exist at a district level and are responsible for multiple worksites grouped either geographically or by client account (e.g., there may be a client who operates over a number of locations, each with a cafeteria).

2.2. Development of the safety and ergonomics instrument

The development of the instrument was guided by several design principles. The instrument had to be (i) practical, easy to use, and completed within 2 hours; (ii) utilized by a staff member who does not need to have background or expertise in ergonomics or generally in OSH; (iii) formatted similarly to existing tools used by the company; and (iv) developed with terminology and topics that align with the company.

The resulting safety and ergonomics assessment instrument consisted of two parts: (1) a site manager interview guide (Appendix A) and (2) a worksite walkthrough guide (Appendix B). The objective of the interview was to determine a manager's perspective on the effectiveness and utility of safety policies, programs and practices related to ergonomics and safety at the worksite- and organizational-levels. The objective of the walkthrough observations was to evaluate safety and ergonomic conditions in the physical environment at key work areas within each worksite.

The design of the instrument drew on prior research conducted by the team to identify injury and MSD hazards in the hospital setting [28, 30]. Through a participatory process, the team and the food service company stakeholders then modified the instrument originally designed for healthcare to better align with the food service industry. This step was informed by a qualitative formative phase [31] consisting of (i) the food service company front line worker focus groups, (ii) the company manager interviews, and (iii) an iterative process with key personnel of the company's health and safety division to modify the original instrument. Through this participatory process, all critical stakeholders – the front line workers, site managers, and the safety and health personnel – identified potential hazards and priorities of concern for inclusion in both parts of the instrument.

The formative phase informed the specific domains and fine-tuned the design of the evaluation instruments including the assessment for safety and ergonomics [31]. The overall participatory approach identified slips, trips, and falls as well as awkward and static body posture-related MSD hazards as walkthrough assessment priorities because these could be addressed with an intervention(s) by management.

Not all OSH hazard categories could be included in the instrument and the participatory process determined criteria for inclusion. The instrument was designed in collaboration with company partners to meet the company's gaps in inspecting factors related to worker safety, health, and well-being needs. As a result, the instrument did not include items the company was already addressing either through a worksite practice intervention or company-wide safety policy. For example, the company had implemented a comprehensive third-party fire safety audit; therefore, fire hazards were not specifically included in the instrument. The process also did not identify specific factors related to repetitive motion as a priority. The instrument did include open-ended questions and comment boxes to note other observations allowing the flexibility to record any immediate safety and health concerns beyond the priority hazard areas predetermined through the participatory process.

Both parts of the instrument were pilot tested in a company worksite not participating in this baseline study and then revised by the research team.

2.3. Site manager interview

The site manager structured interview (Appendix A) included 29 closed-ended questions to assess both the physical and organizational work environment related to safety and ergonomics. Twenty-three of these questions were accompanied with 1 to 4 specific follow-up questions, both open- and closed-ended. Specific assessment categories addressed common safety practices and procedures; slip, trip and fall hazards; work organization aspects; reporting incidents (work-related injuries); jobs requiring standing for more than four hours a day; and client-host relationships and their implications for working conditions. The interviewer recorded answers to the closed-ended questions using the scale options "Does not apply at all 0%," "Somewhat 0–24%," "Frequently 25–49%," "Often 50–74%," "Almost always 75–99%," "Fully applies 100%."

2.4. Worksite walkthrough

The structured walkthrough (Appendix B) contained specific sections for the following key work areas: (i) food service areas, (ii) cashier stations, (iii) food preparation areas, (iv) dry storages, (v) cold storages, (vi) dish rooms, (vii) walkways/staircases, (viii) locker rooms/rest rooms, and (ix) other (to capture any additional areas not already assessed). Each

section had specific statements to assess: (i) safety practices – these covered both safety hazards and positive practices to identify slip, trip, and fall hazards as well as struck by/against, caught-in-between and collision hazards; and (ii) ergonomics – including both MSD hazards and ergonomic practices to identify risk factors related to workers' posture as well as lifting, pushing, pulling and standing tasks. The walkthrough statements related to the physical work environment were recorded using the following scale options: "Does not apply at all," "Applies 0%," "Applies 25%," "Applies 50%," "Applies 75%," "Applies 100%." In total, the walkthrough tool included 75 safety practice statements and 54 ergonomic practice statements (Appendix B). The walkthrough tool statements also included items that required front line worker input such as, "Ask an employee to show you what to do if they encountered an immediate hazard in their work environment," as well as direct observation and interaction with the front line workers during the walkthrough.

2.5. Data collection and analysis

A study team member with a background in OSH worksite evaluation conducted the pilot testing of the instrument at ten worksites. The site manager interview was conducted first. The interviewer recorded responses and additional notes during the interview, and when necessary, asked clarifying questions.

After the interview, the walkthrough part of the assessment was performed. At each worksite, walkthrough observations were conducted during both non-rush and rush times. A rush time in the food preparation area was considered to be the 1.5–2-hour period before lunch. The lunch hours were considered as a rush time in the food service area. The study team attempted to conduct the walkthrough component of the safety and ergonomics assessment independently (i.e., without being escorted by site personnel), take measurements of work surface heights, and take photographs to convey safety messages and illustrate good practices or areas for improvements at each worksite. No employees or customers were photographed.

After each walkthrough, immediate observations on good practices and areas for improvement were communicated to site managers before leaving the worksite. After each visit, data from the two parts of the instrument and accompanying photographs were reviewed and overall worksite findings summarized into a written report.

3. Results

Both parts of the assessment were completed in all ten sites (i.e., 100% response rate) selected for the PoC Trial. The site manager interview lasted between 25 minutes and 1 hour. The worksite walkthrough observations lasted about 2 hours.

3.1. Site manager interviews

3.1.1. Organizational safety management and support for worksites

Site managers reported that there was significant company support for safety and ergonomics at the ten sites. Site managers emphasized the importance of the company's safety coordinators' support and their availability to discuss safety issues.

Managers reported receiving regular information from company safety coordinators to include in safety meetings, training sessions, and safety improvement plans at their worksites. The company provides each worksite with a safety calendar that marks 12 mandatory safety topics (one for each month) and weekly tear-off messages pertaining to both the physical work environment and food safety. In addition, site managers can access safety information from the internal data repository on the company's website.

3.1.2. Common safety practices and procedures at individual worksites

All site managers reported that they conduct required monthly safety inspections focusing on both physical safety and food safety. No one reported unmanageable barriers in implementing action plans to abate unsafe conditions. These safety inspections are typically carried out weekly (7 of 10 worksites); these were reported to be considered a less formal process than monthly inspections.

In addition to monthly and weekly safety topics, daily safety huddles are expected on various topics including day-to-day work, customer reports/complaints, or on specific topics proposed by the safety coordinators. Frequently, due to time constraints, safety huddles are organized on an "as needed basis," perhaps once or twice a week. Most worksites (9 of 10) conduct in-depth training at least once or twice each year on various safety topics. Two worksites reported conducting training sessions monthly. At one worksite, a site manager felt that their staff would benefit from having an opportunity to participate in more comprehensive safety training and thought that current training sessions (e.g., slips/trips/falls, moving heavy/bulky/hot items, back injury prevention) were informal and often condensed into shorter 20-minute sessions. Annual training materials were provided by the company safety coordinators and included lecture guides, participant handouts with accompanying quizzes, and demonstration guides.

All worksites displayed information related to working conditions as well as safety policies, procedures and practices on the bulletin board. One site manager stated that even though bulletin boards included valuable information, these did not necessarily reflect the full picture of safety related activities at the worksite or company at large.

Worksites with more than nine employees (5 of 10 sites) are required to have a safety committee composed of at least three staff members. Four of these five worksites had a safety committee and the site without a committee usually has a committee but due to staff turnover it had not yet been reconvened. Members of each safety committee typically conduct weekly safety observations and monthly inspections of the work environment to identify any safety concerns. In one worksite, the client company coordinated its own building-wide safety committee which included the food service company site manager.

In the study sites, staff were provided with non-slip, closed-toed shoes free-of-charge. In addition, all worksites have an immediate spill-cleanup policy.

3.1.3. Temporary workers

Most sites (9 of 10) hired temporary labor as needed. At this organization, temporary workers were defined as those that are hired to cover permanent staff who are on leave (e.g. sick leave or vacation) and for short-term special events when extra staff are required. They are hired often for jobs like dish washing, food preparation, catering, wait staff, and bartending. Half of the sites (5 of 10) reported hiring temporary labor "often," "almost always," or "all the time." Their safety training varied from site to site. Some site managers (3 of 10) stated that most injuries happen either with newly hired or temporary employees. One manager described the increased work demands in training both new and temporary employees during the first days of hire.

3.1.4. Food service job demands impacting safety practices

When describing barriers to fully implementing safety and ergonomic work practices, managers reported lack of time due to business operation pressures, loss of staff members, or filling out various

types of paperwork. Site managers reported that time constraints are the most frequent barrier limiting their participation in safety trainings. The production demands (e.g., getting meals out on time for customers) are often prioritized over daily safety huddles and training. One manager of a smaller site reported that he was also the worksite's executive chef which further increased his workload.

At the time of the interview, half of the worksites had managers who had participated in mandatory Occupational Safety and Health Administration (OSHA) 10-hour training. One manager explained that he was unable to complete the training due to frequent interruptions related to his site's job demands.

One worksite had recently lost several staff, including their site manager and the majority of their safety committee members; hence, it had been difficult to meet regularly on any safety-related activities.

3.1.5. Reporting incidents

The company has a specific procedure to conduct root cause analyses for reported incidents, including occupational injuries. The company requires sites to complete the root cause analysis within 24 hours of any reported incident, and the site manager is then responsible for assessing each incident and determining how it could have been avoided. First, managers talk with anyone involved in an incident and interview witnesses to find out what happened. Second, information is entered into an online system. One of the company's safety coordinators explained that a barrier for the successful completion of a root cause analysis is when an employee does not report an injury at the time the injury occurred, although they are encouraged to do so. Some managers (3 of 10) found the online system not very user-friendly and felt that the process required more than 24 hours to complete.

3.1.6. Vendor-client contract relationship and implications for working conditions

The food service operations are provided through a vendor-client relationship, guided by an overall contract that specifies many of the parameters of the physical setting as well as the nature of the services to be provided. The site managers described how the contract with the client organization often affected the implementation of safety and ergonomic interventions. For example, if available physical space was limited, and equipment or other items were not stored out of the way; even walkways could become cluttered. One manager explained that replacing out-of-date kitchen and food service equipment with newer and safer options is not always possible; they therefore have to work with what the client offers.

In general, site managers contact the client organization's facilities department staff to resolve potentially hazardous working conditions (e.g., a broken cold storage door) for environments outside of their immediate area or if they cannot do it themselves. The responsiveness to address maintenance issues and manage regular preventive maintenance programs varied by worksite. Establishing a good relationship with the client organization was key for getting help to resolve equipment and building maintenance concerns. The client organization was typically responsible for inspecting equipment and documenting the conducted inspection; the smoothness of this process varied by worksite.

Almost all staff members at all worksites are in jobs that require standing for more than four hours a day. Site managers reported that two breaks are provided for staff: a 15-minute break for breakfast and a 30-minute break for lunch. In some situations, the client company specified that chairs would not be provided for cashiers (2 of 10 sites).

Managers mentioned that construction or renovation activities at the client's premises can affect worksite safety, for example by restricting the existing workspace, spreading dust, and producing excess noise.

3.2. Specific findings from the safety and ergonomics assessment

The study team was able to conduct the assessments independently without being escorted by worksite personnel at 9 of 10 worksites, take measurements of work surface heights at all worksites, and take photos at 7 of 10 worksites. We were able to identify hazards not only related to the physical work environment, but also management-oriented organizational (e.g. work intensity) demands and safety practices. During the assessment we observed good preventive work practices for safety related to the following areas: housekeeping; ergonomics; slips, trips, and falls; struck-by hazards; and general safety (Table 1). Areas for improvement included the following areas: job demands and psychosocial stress; injury reporting; housekeeping; slips, trips, and falls; struck-by hazards, and ergonomics (Table 2). After the assessments, actionable recommendations were developed for all worksites.

Table 1
Summary of good work practices observed at different worksites

Summary of good work practice examples	Number of sites observed ($n = 10$)
Ergonomics	
• Adequate lighting at all areas	10
• Adjustable dumpster height level	1
• Adjustable skillets in food preparation areas	3
• Anti-fatigue mats at cashier stations	8
• Anti-fatigue mats in dish rooms	3
• Assisted pouring systems in food preparation areas	3
• Chairs at cashier stations	5
• Carts for moving heavy, hot, or bulky items	10
Housekeeping	
• Clean work/service surfaces at food preparation and food services areas	10
• Cleaning calendar with assignments for the entire account staff	1
• Janitor closet located right next to the dish room	2
Safety: Preventing injuries from electrical hazards	
• Electric outlets conveniently located	8
Safety: Preventing items falling from heights	
• Rail ledges installed to prevent items falling off storage shelves	1
Safety: Preventing cuts and other acute injuries	
• Guards for slicers and choppers	1
• Separate container dedicated for broken glass & porcelain dish waste	3
• Use of cut-resistant mesh gloves	9
Safety: Preventing slips, trips, and falls	
• Cold storage entrances with inclined flooring with anti-slip material	2
• Eliminating floor wastebaskets at the cashier stations	1
• Floor cleaning equipment located conveniently near the work areas	10
• Improved positioning of the floor wastebaskets at cashier stations	2
• Non-slip, closed-toed shoes provided free-of-charge	10
• Proper floor grid installed in front of the ice machine	2
• Using a newer fryer type with a convenient grease removal system	1
• Walkway with handrails leading to grease disposal area	1

4. Discussion

This study applied a user-centered approach to design a worksite safety and ergonomics assessment instrument to guide safety and ergonomics interventions in a large multinational food service company by engaging those who use the safety systems (i.e., site managers, members of safety committees including front line workers) as well as front line workers who are affected by the safety systems. Our assessment instrument includes two parts, an interview with site managers and a walkthrough observation (including interaction with front line workers about safety practices). Unlike traditional walkthrough observations methods, the assessment's interview portion yielded valuable and candid information on OSH policies and practices at a specific site and the overall company. Site managers of the company are among the key "change agents" whose participation and engagement were critical for the overall assessment. All ten interviewed site managers shared their experience and insights related to both the company's programmatic activities and the work environment. In addition, the walkthrough included questions directed at the front line workers to assess how these policies and practices are implemented practically on a day-to-day basis. This is unique to the instrument we developed and allows the evaluation of not only the physical environment, but also organizational (e.g. peak work times, additional catering activities) and psychosocial factors (e.g. management support for implementing proactive or positive safety practices) that impact safety and health. The association between psychosocial and work organizational risk factors with health and safety is well established, with many countries now advocating for companies' mandatory assessment of these risks [32]. In the food service industry, these associations have also been found, although only a few published studies have been found to be important contributors to safety and health in the food service industry [e.g., 33–35]. Specific examples that we observed in our study included: the overall larger organization provided significant support for safety and this was concretely

Table 2
Summary of possible areas for improvement observed at 10 different worksites

Possible areas for improvement	Number of sites observed ($n = 10$)
Ergonomics: Musculoskeletal disorder hazards	
• Cashier stations without anti-fatigue mats	2
• Dish rooms without anti-fatigue mats	7
• Cashier stations without monitor registers (using old type registers)	2
• Cashiers stations without chair(s)	5
• No height-adjustable workstations (cashier desks)	10
• No height-adjustable food preparation workstations	7
Housekeeping hazards	
• Cartons not disposed of in a timely manner	5
• Equipment kept in walkways or otherwise not stored out of the way	9
• Cluttered cold and dry storage areas	7
• Cluttered spaces inside/underneath cashier stations (at leg areas)	4
Safety: Electrical hazards	
• Blocked access to electrical panels	2
• Overhead electrical outlets in the kitchen	2
Safety: Slip, trip, and fall hazards	
• Blocked access to cold storage	2
• Fryer with a more cumbersome grease removal through a tube underneath	4
• Ice on the freezer/cold storage floor	3
• Lack of footstools/ladders or difficult to locate them	8
• No floor grids around the ice machine or grid not located appropriately	3
• Wet floors in any work area	9
Safety: Struck-by hazards from falling items	
• Items stored above 72 inches and sometimes stacked one on top of the other above 72 inches	10
• Goods not removed from cartons before placing them on shelves	10

seen in resources available for workers (e.g., non-slip shoes, provision of safety training, implementation of immediate spill clean-up policies). A major challenge for the site managers was addressing staffing issues, which had implications for training of temporary, part-time and full-time workers as well as how managers were using their time (e.g., filling in for absent staff) which in turn impacted front line worker knowledge of safety practices.

Another key finding that was revealed by our assessment was the importance of the client-vendor relationship on shaping health and safety practices, and the work environment. This is in line with the increasing nature of new employment arrangements in the modern workforce that play a key role in occupational safety and health [36]. The physical work environment in the cafeteria, as well as other areas accessed by the workers were often built and maintained by the client (e.g. corporate company hosting the cafeteria). In addition, the client has their own health and safety policies and practices that need to be adhered

to contractually. An example of this was that in one of the sites the client would not allow mats for standing at the cash registers, even though this could potentially reduce the risk of musculoskeletal pain for the cashiers. This supports the need for interventions to address policies, programs and practices upstream, not only within the company, but also potentially within the client-vendor relationship.

The site manager interviews identified strengths and barriers of work organizational factors in preventing or reducing OSH hazards. The site manager interviews also identified and contextualized job demands, resource limitations, technology challenges, and vendor-client relationships affecting the overall work environment. This allowed us to learn more about the contextual factors that might limit implementation of some of the recommendations to improve the work environment. The vendor-client relationships affect the overall OSH experience of the company; all of the study worksites operated within the context of a vendor-client environment.

Even though a strong company-wide safety policy exists, safety practices are complicated by the client-vendor relationship at the individual worksite and could limit the implementation of ergonomic interventions such as acquiring safer and more ergonomic kitchen equipment, supplies, and adjustable workstations. Maintenance of equipment and the physical built environment may partly be the responsibility of the client who is "hosting"' the vendor food service company in their building.

4.1. Strengths of the study

OSH walkthroughs using an assessment instrument are not a new approach. Many such tools are available and employed in a variety of settings [22–25]. However, there is a lack of practical and easy-to-use assessment instruments that combine safety and ergonomics for the food service industry. The walkthrough and interview tools developed and used for this study were specifically meant to address safety and ergonomics among FSWs of a large multinational company within the company's existing OSH management system.

The combined walkthrough and structured interview are innovative because those who engage in the company's day-to-day safety systems (i.e., site managers, members of safety committees) and those who are affected by safety systems (i.e., front line workers) contributed to its design.

The data collected through the tools allowed the study team to provide the site managers with immediate feedback – both on good practices and areas for improvement within the physical work environment. This information could then be used by the site managers to develop action plans to address the specific hazards. Site managers informed the study team about organizational aspects of work that may (i) support good practices in the work environment (e.g., good communication with district safety officers; regular maintenance program for kitchen equipment), or (ii) be the root cause for hazardous working conditions (e.g., lack of space/time; a client organization's requirements for the appearance of the food service area).

4.2. Study limitations

Significant issues in work organization can be established by the contractual relationship between the vendor food service company and the client who is hosting the cafeteria in their own built environment.

The variability of the working conditions and work organization is influenced by and, consequently, can be reduced through contractual agreements between the vendor and client. It was clearly true, in the sites we assessed, that some of the variability we observed was due to these contractual differences. Thus, work organization is affected by the vendor-client relationship context and to some extent different worksites cannot be compared to one another. Assessment visits were limited to a 3-hour period in a single day and time that was acceptable for the worksite. The assessment instrument can only capture information about that specific worksite on the day that it was used. The information gathered may not be representative of the typical day at the worksite. Additionally, the participatory approach and the design constraints led to an assessment instrument that did not include cuts, burns, fire safety, and repetitive motion hazards such as those captured by the Rapid Upper Limb Assessment tool [25]. Adapting the tools to other food service settings will require OSH expertise. OSH expertise may also be needed to adjust the walkthrough instrument for other industry settings beyond the food service sector.

Another limitation is that front line workers were not asked the same questions as the managers were asked during the structured interview. Although managers appeared to report openly about the safety practices at their site, it could be the case that front line workers did not feel the same way. We attempted to overcome this by having a thorough and structured observation of the worksite with additional questions for the front line workers about their safety practices. But again, we do not know whether they felt that they could discuss these freely. Overall, our approach engaged front line workers much more than many other walkthrough hazard identification instruments.

4.3. Recommendations for future research

There are several recommendations for future research. First, although this approach was tailored for the food service industry, we believe that it could be adapted and used across other industries. It is important for these adaptations to be made readily available so that others may benefit from the formative research that is used to develop such tools. Second, studies that examine the long-term effectiveness of this kind of participatory approach in improving OSH (e.g., reduction of injury rates) in comparison to non-participatory approaches (e.g. audits) are needed. Third, the coronavirus disease 2019 (COVID-19)

pandemic has highlighted the burden to many industries, workplaces, and front line workers. Our participatory approach may be useful in identifying emerging and new hazardous exposures and other contextual factors that can impact workers' safety and health.

5. Conclusions

Assessment approaches that address both the physical and organizational aspects of the work environment can generate meaningful findings and recommendations to improve working conditions among FSWs. Safety and health assessment instruments – both the interview and walkthrough guides – need to consider the context complexities in which the worksites and the industry operate, as well as client-vendor contractual arrangements.

Supplementary material

The appendix is available in the electronic version of this article: https://dx.doi.org/10.3233/WOR-203399.

Conflict of interest

None to report.

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