Role of Occupational Therapy in Preventing Work-Related Musculoskeletal Disorders With Recycling Workers: A Pilot Study

Thomas Fisher

Little is known about injury prevention in recycling workers; therefore, in this study, I aimed to identify physical and psychosocial risk factors for employees involved in single-stream recycling and to explore strategies for prevention and wellness. Fifteen participants who were either recycling workers or supervisors located throughout seven locations on an urban university campus participated. A mixed-methods research design was used to obtain data through a variety of standardized work environment and health questionnaires and semistructured interviews. Approximately 80% of participants expressed satisfaction with their jobs; 50% reported having a musculoskeletal injury; and 33% reported a lack of support from coworkers or supervisors, which created stress and anxiety. Additional risk factors included poor body mechanics, equipment issues, poor social interactions, and lack of supervisor knowledge for prevention. Occupational therapy practitioners are well situated to support preventive interventions that address the combined physical and psychosocial needs of recycling workers.


In 2013, the U.S. Bureau of Labor Statistics reported that refuse and recyclable material collecting was considered the sixth most dangerous job in the United States. Repetitive heavy lifting, frequent awkward postures, and other repetitive movements have been identified as factors that put recycling collectors at risk (Engkvist, 2010). Given these risk factors, the lower back, shoulder, knee, and cervical spine are the most commonly affected areas (Kuijer & Frings-Dresen, 2004). In one large study, 60% of employees in a recycling plant reported low back pain, and 46% reported shoulder pain across a 12-mo period (Engkvist, 2010). In additional studies, researchers have noted that 17% of waste collectors have been diagnosed with a work-related musculoskeletal disorder (WRMD; Ivens, Lassen, Kaltoft, & Skov, 1998), and more than one-third of waste collectors have reported changing jobs because of work-related injuries (Lund, Iversen, & Poulsen, 2001).

These job task factors are frequently exacerbated by a lack of equipment, poor maintenance of equipment, and inadequate training on lifting techniques and proper body mechanics. For example, a biomechanical workload study showed that lifting an empty four-wheeled container from street to sidewalk exceeds 764.35 lb forces (de Looze et al., 1995).

Once full, recycling containers marked for paper only can easily weigh upward of 75 lb or more, requiring an excessive amount of force to move the containers (Flum, Siqueira, DeCaro, & Redway, 2010). Workers often transport these four-wheeled containers two at a time, with one hand pushing and
the other pulling. Defective or missing wheels on containers increase the risk of injury by forcing workers to drag, lift, or carry the containers to the refuse truck or dumpsters (Camada, Pataro, & Fernandes, 2012). Smaller containers reduce the weight and automated collection systems—presented as a mechanical arm on the side of refuse trucks (Kuijer & Frings-Dresen, 2004)—are solutions that are not always supported or available.

In addition to physical factors, there are numerous psychosocial factors to be considered (Keough & Fisher, 2001). The most common negative workplace psychosocial factors affecting worker health and absence are work pressure demands, lack of ability to contribute to decision making, and social support (Michie & Williams, 2003). Conversely, increased social support, decision making, job control, and low strain increase the well-being of workers (Stansfeld, Shipley, Head, Fuhrer, & Kivimaki, 2013). In the recycling industry, supervisors and managers have limited awareness regarding preventive solutions to reduce injuries and lack of leadership in fostering a supportive work environment. Among blue-collar workers, poor managerial leadership has been shown to contribute to an increase in employee stress by as much as 80% (Westerlund et al., 2010). These psychosocial factors and increased stress only serve to increase the overall risk of sustaining a WRMD.

Recycle handling is a labor-intensive occupation that organically generates a variety of physical and psychosocial hazards. A need exists for further understanding the impact of the full range of these risk factors as well as the prevalence and severity of musculoskeletal injuries within the recycling industry. Given their holistic foundations, occupational therapy practitioners are well positioned to play a vital role in evaluating these risk factors and developing solutions to reduce WRMDs in the recycling industry. The role of occupational therapy practitioners in the prevention and rehabilitation of WRMDs has been well documented by the profession (Braveman & Page, 2012; Fisher & Gibson, 2008; Fisher & Wintermeyer, 2012; Jacobs, 2007); however, little information is known or has been reported about the profession’s role in prevention and treatment of WRMDs in the recycling industry. Thus, the purpose of this study was to use an occupational therapy perspective to explore risk factors and to identify strategies that support prevention and wellness in workers collecting recyclable material on a university campus.

Method

In this study, I used a mixed-methods, nonexperimental research design in which both quantitative and qualitative measures were examined. Standardized assessment tools were used to examine work-related discomfort and aspects of the work environment, and semistructured group interviews were used to further explore these data as they related to worker roles.

Questionnaires and interview questions were specifically selected to reflect accepted assessments in the occupational health safety and rehabilitation industry and a model of practice for occupational therapy (i.e., the Model of Human Occupation [MOHO; Kielhofner, 2008]). The institutional review board approved the study as exempt.

Participants

A purposive, nonprobability sampling method was used to recruit participants from among workers who had a recycling-related job at seven locations on one college campus. The full population from which participants were recruited included 19 people who were either supervisors or employees. Of the 19 possible participants, 3 employees declined to consent, and 1 additional employee was excluded because of being recently hired. Of the 19 possible participants, 79% participated in the study.

Data Collection

After participants gave consent, employees were separated from supervisors. All employee participants completed two questionnaires: the Musculoskeletal Discomfort Questionnaire (MDQ; Wiehagen & Turin, 2004) and the Work Environment Impact Scale (WEIS; Moore-Corner, Kielhofner, & Olson, 1998). The MDQ was developed by the National Institute for Occupational Safety and Health Ergonomics Initiative (Wiehagen & Turin, 2004) and is based on the Nordic questionnaire (Kuorinka et al., 1987). On the MDQ, participants indicated whether they had experienced aches, pains, discomfort, or numbness while at work or home in various body regions (i.e., neck, shoulders, elbows, wrists and hands, upper back, lower back, hips and thighs, knees, or ankles and feet). The WEIS was developed at the University of Illinois at Chicago using MOHO concepts. On the WEIS, participants rated 17 questions related to the psychosocial aspects of the work environment, such as time demands, task demands, interactions with others (including coworkers and supervisors), and rewards.

After completing these questionnaires, employee participants were engaged in a semistructured focus group with discussion focused on 10 questions developed from the Worker Role Interview (WRI; Biernacki, 1993). The purpose of this interview was to examine psychosocial and environmental factors of the university recycling workplace. Similar to the WEIS, MOHO was used as the
Descriptive statistics were calculated for demographic characteristics among the group of participants. Frequencies of musculoskeletal discomfort reports for each region were calculated from the MDQ, and responses to the WEIS were averaged across the group. Qualitative data included remarks provided by the participants during the group interview that were based on these two questionnaires and responses to the interview structured around the WRI. Qualitative data were captured for analysis but were not coded or explored for themes. Instead, these data were searched for responses that provided insight into barriers to a healthy workplace and any suggestions about what changes could be made to increase employee satisfaction and to decrease the effects of negative psychosocial factors such as stress. Qualitative responses from the supervisors on the BBS were similarly reviewed for data that informed these same ideas. All quantitative and qualitative data sources were then converged to identify salient risk factors that could be targeted for intervention.

### Results

The 15 participants included 3 supervisors and 12 employees. Demographic data were collected only from the 12 employees, who were 58% male and ranged in age from 25 to 59 yr. Work experience among the employee participants was evenly spread across categories up to 10 yr, with 1 outlier who reported 15.5 yr of experience. Median experience in recycling work across the group was 7 yr (Table 1).

### Table 1. Demographics and Work Experience of Employee Participants (N = 12)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Participants, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>5 (41.67)</td>
</tr>
<tr>
<td>Male</td>
<td>7 (58.33)</td>
</tr>
<tr>
<td>Work experience in recycling</td>
<td></td>
</tr>
<tr>
<td>1–3 yr</td>
<td>3 (25.00)</td>
</tr>
<tr>
<td>4–6 yr</td>
<td>3 (25.00)</td>
</tr>
<tr>
<td>7–9 yr</td>
<td>3 (25.00)</td>
</tr>
<tr>
<td>&gt;10 yr</td>
<td>1 (8.33)</td>
</tr>
<tr>
<td>Not reported</td>
<td>2 (16.67)</td>
</tr>
</tbody>
</table>

The MDQ revealed that the most prevalent area of discomfort (aches, pain, discomfort, numbness) was in the shoulders. Three participants indicated having trouble in both shoulders, and 1 participant reported having trouble only in the right shoulder (the dominant upper extremity). Two employee participants each indicated having discomfort in their neck, shoulders, and knees, respectively.

Participant average scores on the WEIS ranged from 2.71 to 4.0, with an overall mean score of 3.18, suggesting that participants perceived the overall work environment as supportive. Table 2 shows the means and standard deviations as well as the percentage of nonsupportive responses for all 17 questions on the WEIS. Items 6 and 11 had the highest percentage of nonsupportive responses at 58.33% each, and Items 2, 5, 6, 7, and 11 had a mean less than 3.0, which indicates a level of interference with completing job tasks.

Specifically, 7 of the workers (58.33%) reported excessive social interaction with coworkers, which interfered with their ability to complete job tasks. These workers further reported that there were times at work that they knew they should seek assistance; however, because of the avoidance of their coworkers, they did not seek help, which may have put them in a situation in which an injury could have occurred. One-third of the recycling workers answered in the positive on the item related to coworker support interfering with completing their job tasks, suggesting that teamwork was avoided.

Another one-third of the recycling workers reported that the lack of support from and availability of supervisors interfered with their ability to complete job tasks. This result was further supported by items indicating a lack of...
camaraderie, teamwork, and support in the workplace. Half of the participants reported that the demands at work interfered with their ability to complete job tasks. Finally, more than 40% revealed that they disliked the lack of awareness and respect of students, faculty, and other employees and visitors about the waste, leading to overflowing and heavy recycling containers.

Participants’ responses to the WRI questions during the focus groups provide insight into a typical day. Seven of the 12 participants (58.3%) indicated that they had responsibilities other than recycling, and 4 participants (33%) stated that they had another job. Duties for these workers in addition to emptying large recycling bins included those such as other trash pick-up from faculty and staff offices as well as breaking down boxes and placing them in cardboard dumpsters. Of the participants, 8 (80%) stated that they liked their work; 2 (16.7%) indicated a lack of respect associated with their work; and 4 (33%) disliked that there was a lack of knowledge on the part of students, faculty, and other employees about recycling, leading to high volume of matter in the recycling bins and heavy containers. Six of the 12 participants (50%) indicated that the recycling containers or bins could be modified to help them complete their job tasks, and 3 participants (25%) stated that not having to separate recycling by hand as a result of overflowing and improper waste disposal into recycling containers would help them when completing job tasks. Six of the 12 participants (50%) reported having a work-related injury at some point in their employment.

The supervisors’ responses on the BBS questionnaire indicated that many workers used poor body mechanics during recycling tasks. A comment made by supervisors was “I think better lifting and body movement training is needed.” Supervisors showed limited understanding of how employees were performing their recycling job tasks, indicating a minimal level of knowledge related to injury prevention. They admitted being unfamiliar with safe body mechanics themselves, stating “I’m not sure what tools or equipment could be used.” In fact, there was a general lack of specific protocols for injury prevention within the department. One supervisor noted, “I’m not sure if there is a written procedure for the pulling of recycle and trash,” and another provided a specific example: “Emergency response—there is one for the building but not for the recycling job itself.”

Comments of the supervisors suggested that the lack of policies and procedures, mixed with the lack of proper equipment and injury prevention training, caused pragmatic problems with job performance. One supervisor commented that faculty members deposit unwanted textbooks in recycling bins when they depart the university, leading to extra weight in the bin. Another comment indicated that bags were oversized in relation to recycling bins, which caused faculty or staff to remove the bag from the bin, set it beside the bin, and put more waste in it. It was noted that “the only thing that will cause [an] issue is when someone puts a large amount of books in the can. We need to manually remove part of them to another bag to cut down on the weight. Does not happen often.”

**Discussion**

The aims of this study were to explore risk factors associated with the development of WRMD in recycling workers and to identify the role of occupational therapy practitioners in supporting prevention and wellness. Given the results of this study, recycling workers are most at risk for the development of disorders in the neck and shoulder, which mirrors previous research (Kuijer & Frings-Dresen, 2004). Numerous physical and psychosocial factors that increased the risk of developing these WRMDs were identified in this study. Occupational therapy practitioners are well suited to provide direct intervention—as well as education for supervisors, recycling workers, and other staff and faculty within the university—to reduce the impact of WRMDs in these employees.

The primary risk factors identified in this study included lifting of heavy objects with potentially poor body mechanics, lack of mechanical equipment, managing multiple jobs, and lack of sleep. These findings are consistent
with past research in which lifting heavy objects with poor body mechanics and improper equipment was found to be one of the main factors for WRMDs within recycling centers in Sweden (Engkvist, 2010). Unfortunately, in addition to poor performance by the workers, supervisors are not trained to identify proper lifting techniques, and body mechanics as well as policies and procedures are not developed to minimize injuries. The size of the recycling container and its contents are an important consideration. When lifting a 50- to 60-lb bag out of a container, the friction of the bag against the container can create a vacuum, which requires more force to remove the bag from the container (Goggins, 2007).

In addition to physical risk factors, negative psychosocial factors indicated by participants of this study on the WRI included poor social interactions with coworkers, lack of teamwork, and lack of support from both coworkers and supervisors. However, when answering items from the WRI during the focus groups, 80% of the recycling workers answered “yes” to the item “Do you like your job?” Two participants indicated a lack of respect associated with their job tasks by supervisors. Low social support is one of the most common negative psychosocial factors in the workplace associated with the development of WRMDs (Hauke, Flintrop, Brun, & Rugulies, 2011; Michie & Williams, 2003).

Significant opportunities exist for occupational therapy practitioners to play a role in the prevention of WRMDs in recycling workers. Occupational therapy practitioners are academically trained to provide skilled services in the area of work and industry that involve helping injured workers return to work, modifying the work environment to decrease ergonomic hazards and to increase occupational performance, as well as reducing and preventing WRMDs (Kaskutas & Snodgrass, 2009). A significant need identified in this study is for education on proper and safe body mechanics to decrease awkward postures that have been found to contribute to WRMDs (Chan & Leung, 2011; Occupational Safety and Health Administration, 2014; Stuebbe, Genaidy, Karwowski, Kwon, & Alhemood, 2002). In addition to body mechanics, workers would benefit from training in flexibility exercises and other education related to the overall promotion of health and wellness both during and outside of work. Just as important, it is necessary to increase conversations with supervisors to develop injury prevention protocols, improved methods for incident reporting, and policies supporting stretch breaks and job rotations. Supervisors would benefit from training in transformational leadership, including psychosocial support, effective communication, and positive interactions between coworkers and supervisors to decrease stress in the workplace (Keough & Fisher, 2001; Stansfeld et al., 2013).

Future researchers should consider a larger sample of recycling and waste collectors on college campuses, not just high-volume locations, and more universities within the United States to improve generalizability. Because 50% of the participants believed that modifying the recycling container would be helpful, future researchers can concentrate on what modifications should be made to improve efficiency and to reduce ergonomic risks related to the job task of recycling. Occupational therapy practitioners partnering with rehabilitation engineers or mechanical engineers to design human factor safe processes could be helpful to the industry.

Implications for Occupational Therapy Practice and Research

The findings of this study have the following implications for occupational therapy practice and research:

- Recycling workers are part of a growing occupational category, and they require increased training and attention to workplace injury prevention practices.
- Occupational therapy practitioners are holistically trained and well situated to support education and interventions necessary to reduce both physical and psychosocial risk factors for WRMDs in the recycling industry—specifically for proper body mechanics, preventive stretching, equipment and task modifications, stress management, and interpersonal skills training.
- Given risk factors identified in this and other similar studies, increased large-scale research studies are needed to evaluate the effectiveness of preventive interventions and training within the recycling industry.

Conclusion

For a century, occupational therapy practitioners have had work as a domain of concern when providing services to clients. Because of this longstanding area of focus, members of the American Occupational Therapy Association established a Special Interest Section focused on this area of practice. The issues discussed in this article reflect this history and specialization. ▲

Acknowledgments

The following people deserve special acknowledgement for their contributions to this study: Ethan Bremmer, Olivia George, Beauregard Middaugh, Rebecca Spratt, Carla Kinman-Umphries, and Samantha Whitaker.
References


