FEATURE ARTICLE
Research

Risk Factors Associated With Work-Related Musculoskeletal Disorders Among Female Flight Attendants

Using a Focus Group to Prepare a Survey

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Abstract

In preparation for surveying female flight attendants about work-related musculoskeletal disorder risk factors and symptoms, a focus group study was completed with members of the target population. The aims of this study were to ensure completeness of a previously developed list of physically strenuous job tasks performed by female flight attendants and assess the clarity, appropriateness, and applicability of existing self-reported measures to be used in the survey. Female flight attendants who worked one or more long-haul international flights in the prior 3 months and 75 or more hours in the prior month were recruited from the union membership. A trained moderator led a 2-hour discussion with the flight attendants. With use of a transcript-based analysis, a final list of 41 job tasks was created. Useful comments on a set of self-reported measures were obtained. The information provided an essential step toward integrating workers' perspectives into development of the survey.

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BACKGROUND

According to the Bureau of Labor Statistics (2005), the air transportation industry is hazardous and flight attendants (a female-dominated occupation) had injury and illness rates comparable to those of all workers in their industry in 2003:

- The air transportation industry reported 11.0 nonfatal injuries and illnesses per 100 full-time workers.
- The air transportation industry had occupational injury and illness rates several times higher than mining (3.3 per 100 full-time workers), construction (6.8 per 100 full-time workers), and private industries overall (5.0 per 100 full-time workers) in the United States.

The Bureau of Labor Statistics (2005) also reported a total of 5,670 nonfatal occupational injuries and illnesses that caused flight attendants to lose workdays in 2003. Of these, work-related musculoskeletal disorders accounted for:

- Approximately 32% of the cases of lost workdays.
- A nearly four times higher median number of lost workdays (22 days) among flight attendants than two other female-dominated occupations (registered nurses and nursing aides) with the greatest number from work-related musculoskeletal disorders.

Although few studies have been conducted, work-related musculoskeletal disorders of the trunk, which in-

clude the neck, shoulders, and back, accounted for the largest percentage of these disorders among female flight attendants (Haugli, Skogstad, & Hellesoy, 1994; Iglesias, Gonzalez, & Morales, 1989; Logie, VanDerDoe, & Ryan, 1998). According to compensation claims data from Air British Columbia, problems with the trunk also accounted for the highest average compensation costs (Logie et al., 1998).

Trunk work-related musculoskeletal disorders among female flight attendants might be explained primarily by the physical load associated with their job tasks, including manual materials handling (e.g., frequently pushing or pulling heavy carts and lifting or carrying heavy objects) and uncomfortable work postures (e.g., prolonged standing and frequent bending) (Logie et al., 1998). In a recent study of Korean flight attendants, Han (2003) found that self-reported work activities, such as "manually handling materials heavier than 11 pounds" and "bending greater than 20°," significantly increased the risk of back pain. The relationship between job tasks and flight attendants' work-related musculoskeletal disorders is consistent with findings from extensive reviews of work-related musculoskeletal disorder risk factors in a variety of occupational groups (Bernard, 1997; National Research Council & Institute of Medicine, 2001). In an earlier study (Haugli et al., 1994), female flight attendants on long-haul (6 hours or longer) international flights (Lapostolle et al., 2001; Whitaker, Soong, Terzis, & Yeh, 2005) were more likely to experience musculoskeletal symptoms than those on short-haul flights. The number of steps taken by flight attendants during long-haul international flights, an indicator of flight attendants' physical loads, increased with the number of flight hours (Hagihara, Tarumi, & Nobutomo, 2001). However, a better understanding of actual job tasks that may place long-haul international flight attendants at increased risk for work-related musculoskeletal disorders is needed.

Flight attendants' job tasks vary depending on flight schedules, passengers' needs, types of aircraft, and types of service sections. Thus, it is not feasible to observe flight attendants' representative job tasks during any given time period or use direct measures such as biomechanical parameters in their actual work environment (i.e., working in a moving aircraft). Therefore, subjective estimation of physical load by temporal distribution (frequency) (National Research Council & Institute of Medicine, 2001) and psychophysical methods (e.g., perceived exertion and strenuousness) (Capodaglio, 2002) was deemed suitable to measure physical load related to job tasks for this occupational group. Conrad, Lavender, Reichelt, and Meyer (2000) combined self-reported frequency of job task and degree of physical strenuousness to measure physical load resulting from firefighters' job tasks. In that study, self-reported measures were matched with task-specific items, enabling occupational health nurses and ergonomic teams to prioritize specific tasks for further simulated analyses. However, the content of the existing self-reported job task measure for flight attendants (Han, 2003) is general (e.g., bending and lifting) and not tied to a specific task. Thus, contextual understanding of job tasks performed by female flight attendants on long-haul international flights is needed.

What Does This Mean for Workplace Application?

In the process of work-related musculoskeletal disorder survey preparation, this focus group study provided information on the range of flight attendants' job tasks and led to a finalized self-reported job task measure with task-specific items. The measure will allow occupational health nurses and ergonomic teams to focus on surveillance and identification of hazardous job tasks and prioritize job tasks for further task analyses. In addition, the focus group was helpful in refining existing measures that had been generated for different populations so that they would be appropriate for the target population, which has scarcely been studied. Thus, it is suggested that occupational health nurses use the focus group method to integrate workers' perspectives into self-reported measures for work-related musculoskeletal disorder risk factors and symptoms, particularly for occupations with variable job tasks and unique work environments.

In the process of job task item development, it was important to glean workers' perspectives of their job tasks. The focus group, defined as a research method to collect data through group interaction (Morgan, 1996), has been emphasized in occupational health research to better understand the impact of the work environment on health issues (Mergler, 1999; Needleman & Needleman, 1996). It has been a useful method for identifying problems that lead to work-related musculoskeletal disorders, particularly at early stages of ergonomic research of specific occupations with various exposures (Conrad, Balch, Reichelt, Muran, & Oh, 1994; Messing, Seifert, & Escalona, 1997). Specifically, the method has been used to develop survey content for workers' health and safety (e.g., flight attendants' psychosocial stressors and health [Ballard et al., 2004] and farmers' sun safety [Ing, Ashbury, Marrett, From, & Perry, 2002]).

Measures have been generated for different populations but modified for use with the target population so content, wording, and phrasing applicable to this group are included (Loesch & Vacc, 1993; O'Brien, 1993). With the use of previous surveys, several self-reported measures were developed to assess workplace organizational (e.g., psychological demand and social support) and environmental (e.g., vibration and noise) factors and work-related musculoskeletal disorder symptoms. Organizational and environmental factors have been found in previous studies to be risk factors for work-related musculoskeletal disorders (National Research Council & Institute of Medicine, 2001). The factors directly influence physical load by producing increased muscle tension and exacerbating biomechanical strain (Bongers, De Winter, Kompier, & Hilderbrandt, 1993; Sauter & Swanson, 1996) or psychological strain that links to physiologic mechanisms

(e.g., prolonged muscle activity) (Bongers et al., 1993; Lundberg, 1999). In this survey, organizational factors were restricted to the workplace because the relationship between individual factors associated with roles outside of work (e.g., family problems) and work-related musculoskeletal disorders is not clear (Bernard, 1997). Several reliable and valid measures of work-related musculoskeletal disorder risk factors and musculoskeletal symptoms have been used in prior work-related musculoskeletal disorder studies (Kuorinka et al., 1987; Morken et al., 2003; Palmer, Smith, Kellingray, & Cooper, 1999; Rosecrance, Ketchen, Merlino, Anton, & Cook, 2002; Wahlstedt, Bjorksten, & Edling, 2001), but have yet to be validated for use with flight attendants. Refining the measurement tools to enhance respondents' understanding of items, response options, and instructions is an important step in ensuring the content validity of the measures (Haynes, Richard, & Kubany, 1995).

Researchers undertook a series of preliminary steps to establish a reliable and valid self-reported measurement tool including job tasks, work organization, environment, and work-related musculoskeletal disorder symptoms prior to the focus group study. These steps included a review of relevant work-related musculoskeletal disorder studies, including two job analyses of flight attendants' work (Logie et al., 1998; United Airlines, 2001); meetings with flight attendant union management and air safety and health experts; and conversations with current flight attendants. The first author, previously an airline occupational health nurse, had observed flight attendants' tasks and the cabin environment and case managed flight attendants with work-related musculoskeletal disorders. These experiences also contributed to the initial phase of survey preparation.

In the preliminary work, the investigators drafted an initial set of job task items. The items included 9 general work postures with definition of each work activity within the question stem (e.g., kneeling [bending legs at the knees to come to rest on a knee or knees]); 2 manual handling activity items with specific examples by weight levels (e.g., lifting and carrying at least 10 pounds [a liquor miniature tray weighs 9 pounds and a fully loaded pot of coffee weighs 4 pounds]); and 2 task-specific items (lifting and carrying passengers' baggage to stow in overhead compartments and pushing or pulling service carts). In addition, self-reported measures of work-related musculoskeletal disorder risk factors and symptoms obtained from existing measures that had been generated for different populations were prepared for focus group participants. The draft of job task items and selected self-reported measures were reviewed with union health and safety department staff.

In preparation for a survey to assess trunk work-related musculoskeletal disorder risk factors and symptoms in female flight attendants on long-haul international flights, this focus group study was conducted with members of the target population. The specific aims were to (1) ensure completeness of a previously developed list of physically strenuous job tasks performed by female flight attendants and (2) assess the clarity, appropriateness, and applicability of existing self-reported measures for work-related musculoskeletal disorder risk factors and symptoms to be used in the survey.

METHODS

Design

A focus group was conducted with currently employed female flight attendants who routinely work long-haul international flights.

Population and Sample

The study population was female flight attendants who routinely work long-haul international flights with a major airline in the United States and are members of the Association of Flight Attendants–Communications Workers of America (AFA–CWA), the largest flight attendant union with more than 46,000 members from 26 airlines in the United States (AFA–CWA, 2004). Of the six AFA–CWA airlines with international flights, one was selected for this study because the identification of flight attendants with international flights was not available from the others. For this airline, approximately one-third of the total 10,000 female flight attendants employed were assigned to international flights in a given month (D. Mokadam, personal communication, November 2, 2004). Working international flights is often more valued than working domestic flights because of overseas travel opportunities and extra compensation for international flights (e.g., higher salary and per diem than for domestic flights at the same level of seniority). Work schedules, however, are obtained on a seniority basis through a process of bidding. The most senior flight attendants are likely to work the most desirable and valued schedules. A small number of junior flight attendants with foreign language proficiency also work internationally (AFA–CWA, 2005; U.S. Department of Labor, 2005).

Inclusion criteria were being female; having worked at least one long-haul international flight, including meal services and duty-free sales, in the prior 3 months; and having worked at least 75 hours in the prior month. On average, flight attendants fly 75 hours a month (U.S. Department of Labor, 2005), and flight time of 6 hours or more is usually considered a long-haul flight among flight attendants (Lapostolle et al., 2001; Whitaker, Soong, Terzis, & Yeh, 2005). These definitions were confirmed by flight attendants who participated in the focus group study.

Flight attendants were recruited from the union membership of the airline. Prior to recruitment, the investigators met with union health and safety department staff for their support, and also communicated with two key informants who were committee members of the local union in a large Midwestern metropolitan area to identify participants. Flight attendants were recruited by e-mail using the union membership list, by solicitation through word of mouth by the key informants, and by flyers posted on the bulletin board in the union office inviting flight attendants to participate in a 2-hour focus group discussion. Flight attendants who were interested in the study were asked to contact the principal investigator by phone or e-mail.

During a 2-week recruitment period, 22 (0.8%) of approximately 2,800 women responded—10 by phone and 12 by e-mail—expressing interest in participating in the study. Of the 22 women, 16 were contacted by phone, given further explanation of the study, and screened for eligibility; the rest could not be reached during the recruitment period. Two of the women screened were not eligible because their work hours had totaled less than 75 in the prior month. Six of the eligible women were not able to confirm their availability, leaving 8 women who were scheduled for the focus group on July 7, 2004. A letter was sent thanking them for agreeing to participate and informing them about the study and confidentiality of data. Two reminder phone calls were made; the first was 1 week before and the second the day before the scheduled focus group meeting. Six women actually participated in the focus group (there was one last-minute cancellation and one no-show). The participants were provided with dinner and parking reimbursement and given $30 in appreciation for their participation. The information on these incentives, which are acceptable for focus group studies (Krueger & Casey, 2000), was explained as "eligible participants would receive a cash gift for their time" on the recruitment material but the amount of cash was omitted.

Instruments

The three instruments used in this focus group study were a focus group discussion guide; self-reported measures for work-related musculoskeletal disorder risk factors and symptoms; and a brief background questionnaire.

The investigators developed the focus group discussion guide based on the process presented by Krueger (1994):

- Introduction including a welcome and ground rules.
- Topic questions and probes.
- Summary and conclusions.

Key open-ended questions used to guide the discussion are listed in the Sidebar on this page.

Measures of work organization, environment, and work-related musculoskeletal disorder symptoms were used to assess their applicability for flight attendants. Self-reported measures for this focus group discussion consisted of three parts:

- Work organization: 25 items of the Job Content Questionnaire (Karasek, 1985) for measuring psychological job demands, decision latitude, social support, and job insecurity.
- Environment: 12 items of physical environmental factors in the cabin (e.g., uncomfortable humidity, excessive noise, and whole body vibration) and 2 items of uncontrollable external environmental factors (turbulence and the threat of terrorism) based on the physical environment scale of the Repetitive Motion Survey (Communications Workers of America, personal communication, February 10, 2004) and a literature review that addressed cabin environment (Nagda & Koontz, 2003; Pieren, 1997).
- Work-related musculoskeletal disorder symptoms: Nordic Musculoskeletal Questionnaire (Kuorinka et al., 1987) for symptom presence and National Institute for Occupational Safety and Health (NIOSH) Symptom Survey (Bernard, Sauter, Fine, Petersen, & Hales, 1994) for symptom frequency, duration, and intensity.

In addition, the researchers assessed frequency, strenuousness, and intensity of symptoms experienced while performing the job tasks in the survey. The descriptors for each of these dimensions were obtained from three different measures: frequency (U.S. Department of Labor, 1991), strenuousness (Conrad et al., 2000), and intensity of symptoms (Wilkie, Lovejoy, Dodd, & Tesler, 1990). The investigators assessed the appropriateness of their use in measuring the job tasks of flight attendants during the focus group.

The brief background questionnaire contained 10 questions (age, years of employment as a flight attendant, work pattern, additional jobs, number of flight hours per month, number of sectors per week, number of hours per segment, service section, job responsibility, and types of aircraft). It was used to collect demographics and work backgrounds of participants in the focus group.

Data Collection

The focus group session lasted approximately 2 hours and was tape-recorded. A trained and experienced moderator led the focus group, and a research assistant took notes on posters displayed on the walls so that participants could review what had been discussed. An observer took field notes, operated the tape recorder, and monitored environmental conditions. Before the focus group discussion, the flight attendants signed consent forms agreeing to participate in the meeting and be tape-recorded.

Key Questions From the Focus Group Discussion Guide

Job tasks

- What physically strenuous job tasks are performed in the cabin?

  Probes

  - What makes the task physically strenuous?
  - Which job tasks do you think produce trunk pain or discomfort?

Measures for work-related musculoskeletal disorder risk factors and symptoms

- What are some things that make it difficult for you to respond to these questions?

  Probe

  - Vague words and appropriate response categories

Physically Strenuous Job Tasks

Handling carry-on baggage

1. Carrying passengers' bags
2. Carrying crew bags while walking upstairs and downstairs
3. Lifting and reaching to stow passengers' bags in overhead bins
4. Lifting and reaching to stow crew bags in overhead bins
5. Reaching, pulling, and pushing bags to reposition in overhead bins
6. Reaching and pushing to close overhead bins

Handling carts

7. Pulling and pushing beverage carts with hands while walking on an incline
8. Pulling and pushing meal carts with hands while walking on an incline
9. Pulling and pushing duty-free carts with hands while on an incline
10. Pushing against the cart with knees and hips
11. Pushing and pulling to steer the cart away from passengers
12. Pushing and pulling carts to reposition in the galley
13. Pushing and pulling carts to move upstairs or downstairs by an elevator

Galley work

14. Lifting bins out of carts over your head into galley
15. Reaching to reposition galley bins in higher levels
16. Reaching, bending, and squatting to reposition galley bins in lower levels
17. Reaching to latch galley bins in higher levels
18. Reaching, bending, and squatting to latch galley bins in lower levels
19. Reaching, bending, and squatting to take the lids off food in carts
20. Reaching for the supplies in higher galley bins
21. Reaching, bending, and squatting for supplies in lower galley bins
22. Lifting food load into the ovens to cook and pulling it out of the ovens

Service (beverage, meal, and duty-free)

23. Hand-carrying the coffee pot
24. Rotating wrist to pour coffee and beverages
25. Reaching to serve passengers
26. Pinching tongs to hold service items
27. Reaching and bending to serve the passengers at the window seat
28. Reaching for items while kneeling
29. Squatting to take meal trays in and out of carts
30. Lifting and carrying heavy duty-free sale items
31. Squatting and pulling bottom bins with heavy items

Safety checks

32. Reaching, bending, and squatting to read pressure gauges
33. Pushing aisle seats into upright positions
34. Reaching and pushing window and center seats into upright positions
35. Pushing with feet to restore footrests to proper positions

Other

36. Arming and disarming door
37. Standing for a long time
38. Walking for a long time
39. Lifting or physically assisting disabled or elderly passengers
40. Sleeping in passenger seat in economy section
41. Awkward postures when sleeping in cramped bunk beds

Using the focus group discussion guide, the participants were asked to discuss physically strenuous job tasks they perform during long-haul international flights from the time they enter the cabin until they leave. The moderator segmented the time period into pre-passenger boarding, passenger boarding, in flight, and after landing. After the main discussion, self-reported work-related musculoskeletal disorder risk factor and symptom measures were distributed to the participants. They were asked to review them and discuss the appropriateness and applicability of the measures for female flight attendants. At the end of the focus group session, participants were asked to complete the brief background questionnaire.

Analysis

A transcript-based analysis, using complete transcripts of the focus group as a basis for analysis, was conducted (Krueger, 1994). This method lent itself to completeness by recording all details in the original language of the participants and clarifying information on the tape (Bertrand, Brown, & Ward, 1992). The tapes were fully transcribed. Based on transcripts, job tasks were listed for the entire time the flight attendants were in the cabin. Information written on the posters and the observer's field notes were used to supplement the transcripts in generating a list of main job task categories. Five physically strenuous job task categories were identified, and all job tasks were sorted into categories on the basis of similarity.

Job tasks were then compared with a previously drafted list of job task items, including general work activities (e.g., bending, kneeling, lifting, and pushing). The list of physically strenuous job task items was reviewed by two current flight attendant volunteers who were not members of the focus group. Finally, the list was agreed on by two air safety and health experts, an industrial hygienist and Occupational Safety and Health Administration specialist and a flight attendant staff member in the union health and safety department.

RESULTS

Sample Characteristics

Ages of those in the sample ranged from 31 to 59 years, with five being older than 50. The mean age was 51 years and the median age was 55 years. The mean length of employment as a flight attendant was 29 years and the median length of employment was 33 years. Only one of the participants was a junior flight attendant with 6 years of employment; the rest were senior flight attendants with more than 28 years of employment. The majority had been working without interruption since the age of 18. The sample and study population were comparable in age and length of employment, which were available from the AFA–CWA (mean age, 54 years; median age, 56 years; mean length of employment, 30 years; and median length of employment, 33 years).

They averaged 92 flight hours per month and approximately 3 flight segments per week. Only one of the participants was assigned to serve economy class; the others were currently in charge of either business or first class only or served all classes. Two of the participants were pursers who coordinate service, supervise other colleagues, and work cabin to cabin. Five participants worked in a Boeing-747 or Boeing-777 aircraft and two of these flight attendants worked equal time in each type of aircraft. All of the participants reported neck, shoulder, or back symptoms associated with their job tasks in the past year.

Job Tasks

The discussion about job tasks was dynamic and interactive and the atmosphere was comfortable. During the discussion of job tasks, participants stood up and demonstrated motions and postures. They talked to each other and drew confirmation from one another at the end of the discussion while reviewing the job tasks noted on the posters.

The participants said they felt that work in the following five categories was physically strenuous: handling carry-on baggage, handling carts (beverage, meal, and duty-free), galley work, service (beverage, meal, and duty-free), and safety checks. These tasks were consistent with the previously drafted job task list based on a literature review and feedback from union management and air safety and health experts, but, most important, the focus group discussion illustrated contextual understanding of job tasks and made the list task specific. In addition, two items, "sleeping in passenger seats in the economy section" or "awkward postures when sleeping in cramped bunk beds," which came up at the meeting with union staff prior to the focus group, were confirmed by the participants. Within these five categories and an "other" category, a list of 41 physically strenuous job tasks was generated and is provided in the Sidebar on the previous page. Comments from the participants supporting the final list follow according to Krueger's (1994) method of presenting focus group data.

The participants said that handling carry-on bags was most physically strenuous. Five working activities, including carrying, pulling, pushing, lifting, and reaching, were consistently mentioned. The participants said that stowing passengers' bags should not be their responsibility, but they have to carry and lift carry-on bags that passengers leave at the exit doors to stow them in overhead bins. They also push or pull the bags frequently for repositioning and reach their hands above their shoulders to open and close bins. The flight attendants carry and lift their own crew bags up over their heads, and sometimes walk upstairs and downstairs with the bags when boarding or landing.

There are passengers who bring on bags and leave them down. At the last minute, we have to carry these bags up to the front, find the passengers, and put them away. Bags, briefcases, and laptop computers need to be stored. We are still lifting people's luggage.

The overhead area is very important. We need to reposition the bags to close bins and make room for passengers' belongings. You are pulling them and then you are trying to close the bins. You are reaching and pushing.

Putting away our bags is one of our tasks. For me, it is my first task. There are definite places where you must put your bag in the overhead area. That bag could weigh 25 to 30 pounds.

The participants described frequent pushing and pulling of carts as a physically strenuous required task. The flight attendants handle three types of heavy carts (i.e., beverage, meal, and duty-free). They push and pull the carts to reposition them in the galley and move them upstairs and downstairs by elevator. When walking in the cabin aisle, they frequently push or pull carts on an incline and also steer them away from passengers.

You have to move the used carts upstairs and then on the elevator. Someone is pushing and you are going backwards. Sometimes you fall. I know four girls who have hurt themselves.

Beverage carts weigh 250 pounds and sometimes you push them up an incline. You are encouraged to get the first drink out within minutes.

You have only so much room to work with. If you are at a certain door where the galley is, then you are trying to accommodate the passengers who are sitting near the galley so that you don't throw the cart on them. You are actually trying to keep the cart away from the passengers. You do that by any means necessary, perhaps causing yourself injury.

In the limited galley space, the flight attendants are involved with lifting, reaching, bending, and squatting to perform their jobs. Frequent reaching above the shoulders to reposition galley bin contents, latch galley bins, and

place the supplies at higher levels is viewed as physically strenuous. To reach the lower-level galley bins, the flight attendants frequently bend forward and squat. They perform frequent lifting when taking bins out of carts, placing bins overhead into the galley, and loading food into the ovens. One participant also mentioned that she used to reach, bend, and squat to take the lids off the food in the carts.

You are positioning carts and lifting bins over your head. Our galley has separate areas with different levels of bins. Some are high and some are low, so you are repetitively reaching and bending for the supplies.

I need to load all that food in the ovens to cook it for breakfast, which means lifting and loading!

You need to lift it out of the oven and put it with the salad. You are dealing with heat and still lifting.

The participants felt that serving beverages and meals and conducting duty-free sales were physically strenuous; these various work activities require reaching, bending, kneeling, squatting, and lifting. They reported that hand-carrying the pot filled with coffee or hot water is strenuous. Most participants said that they kneel or squat while taking beverages, duty-free items, and meal trays out of carts. During duty-free sales, they lift and carry heavy duty-free items or bins and squat and pull out bottom bins with heavy items.

Most flight attendants are carrying the coffee pots to the point that they have to change them. The pots themselves are heavy and they are filled with liquid. When you are doing the second coffee on an aisle, you are carrying the coffee pots, trays, and other items and pouring.

You have to reach toward the window to serve. You have to bend all the way over to serve that passenger at the window seat. Everybody tends to forget that now you are serving the person in the aisle because that person chooses not to grab the food. There is also bending and stretching.

Right after the first service, we start duty-free. This is very strenuous. There are liquor bottles, some of which are heavy. You have to pick out everything, which means bending, pulling, pushing, and lifting.

The participants mentioned that checking safety was also physically strenuous. Flight attendants have to reach, bend, and squat to read pressure gauges prior to passenger boarding. For passengers' safety, they push aisle seats into upright positions, reach and push window and center seats into upright positions, and push with their feet to restore footrests to proper positions before taking off and landing.

The other thing we do is bring seats to the upright position because passengers refuse to do it themselves. We are pushing. We are also restoring footrests. We do that with our feet.

Flight attendants thought their jobs were physically strenuous because they stood or walked for a long time in the cabin. The participants also addressed their short breaks and uncomfortable postures when sleeping in seats or bunk beds. They experienced physically strenuous work when they assisted disabled or elderly passengers from seats to bathrooms or the exit. One participant mentioned that disarming the door is also a physically strenuous task.

You have to be on your feet for a number of hours. During a trip to Japan, which can take anywhere from about 12 to 13 hours, or a trip to Hong Kong, close to 16 hours, we are constantly on our feet. A lot of us have foot problems. We do a lot of walking!

During the night, we are still doing our assigned jobs. We are still working on foot even though the lights are out in the cabin and people are sleeping. We are setting up the next service.

You have an hour break on flights to Europe and passenger seats, which are very uncomfortable on the back, neck, and arms. You are trying to squat down to sleep. Or, you try to put your feet up on your own bag. You're cramped. This is how we sleep for an 8-hour flight. We only sleep on that seat for 1 hour and that is enough for me.

Going to Beijing or Hong Kong, you usually have a paper sheet, two pillows, and a bunk. This is claustrophobic for some people. You are jumping out of your bed and into your clothes. You may fall down a few steps.

It is strenuous to disarm your door and get down there and lift that bar. It is hard to lift, slide, and disarm!

Self-Reported Measures for Work-Related Musculoskeletal Disorder Risk Factors and Symptoms

The focus group participants provided useful comments regarding the self-reported measures for work-related musculoskeletal disorder risk factors and symptoms. The flight attendants explained problems (e.g., vague words or inappropriate response categories) they found in responding to some of the self-reported measures and made suggestions for modifying or adding questions and providing examples to be added to the measures (Table). All participants welcomed the opportunity to give input into development of the questionnaire.

For the question about the frequency of job tasks ("On average, how often did you do each of following tasks per shift?"), the participants suggested using the terminology of "segment" or "leg" instead of "shift." Response options of the measures (frequency, strenuousness, and intensity of the associated pain and discomfort of job tasks) were all acceptable to the flight attendants except one response category for the frequency measure. Among four response categories ("not done," "occasionally," "frequently," and "constantly"), the participants suggested changing the highest response category from "constantly" to " almost always."

The participants reviewed the content of the questions regarding workplace organizational factors (psychological job demands, decision latitude, social support, and job insecurity). Psychological job demands (e.g., work fast and work hard) and decision latitude (e.g., learning new things and little decision freedom) were understandable and applicable to their work situations. Comments from one participant on social support indicated that flight attendants rely on each other rather

Table

Summary of Recommendations for Self-Reported Measures

Measure	*Recommendation*
Job tasks	Modifying question wording or response categories
• Frequency	• From "shift" to "segment" or "leg" • From "constantly" to "almost always"
Work organization	Modifying question wording or response categories
• Social support	• From "supervisor" to "purser" or "lead"
• Job insecurity	Adding response categories or items • "Furloughs-off" • Individual ability–related items
Environment	Adding items • Spraying insecticide
Work-related musculoskeletal disorder symptoms	Adding items • Additional types of symptoms (e.g., burning, tingling, and stabbing) • Additional body parts (e.g., hips, elbows, and ankles)

than being supervised. The other participants agreed with this and suggested changing the wording from "supervisor" to "purser" or "lead." In response to the job insecurity question ("How steady is your work?"), participants reported that their jobs have been seasonal with frequent layoffs and also suggested adding "furloughs-off" to response categories. In response to one of the job security questions ("How likely is it that during the next couple of years you will lose your present job with your employer?"), participants wanted to clarify whether the question referred to losing their jobs because of the industry or their own abilities. One participant mentioned that flight attendants would perceive job security differently by seniority. Senior flight attendants might feel more secure than younger flight attendants because they are given priority to bid on flight schedules and position assignments in the cabin and might be less likely to be furloughed.

Participants perceived that the degree of symptom intensity for "discomfort" was lower than that for "ache" or "pain." Therefore, they found the question about presence of symptoms vague because it referred to three different types of symptoms (discomfort, ache, and pain). They suggested that other types of symptoms, such as burning, tingling, and stabbing, be included in the questionnaire. Participants experienced musculoskeletal symptoms in various body parts and suggested adding other body parts (e.g., hips, elbows, ankles, feet, knees, and wrists) as well as trunk.

In addition to musculoskeletal symptoms, several other health problems were addressed. First, one participant reported that her coworkers have had sleep disorders because time change affects sleep patterns. Second, cabin air quality was considered a potential risk factor for dermatologic and eye problems. Third, the participants also thought that they were at higher risk of exposure to contagious diseases, such as tuberculosis and chickenpox, and of being injured (e.g., bruises and burns). Finally, one participant addressed health problems related to radiation exposure, especially for pregnant flight attendants.

DISCUSSION

The use of self-reported measures in work-related musculoskeletal disorder studies that examine the relationship between risk factors and the occurrence of such disorders is common, particularly for occupations with variable and irregular job tasks such as flight attendant. To date, no self-reported measures have been developed specifically for flight attendants. The job-specific tasks identified during this study will enable occupational health nurses and ergonomic teams to assess hazards and develop interventions. Prior to conducting a work-related musculoskeletal disorder survey among flight attendants, this study contributed to developing the actual job task items from the flight attendants' perspectives and refining existing self-reported measures. This work will strengthen the validity of the planned survey.

Limited information about flight attendants' job tasks that increase the risk for work-related musculoskeletal disorders is available in a study conducted by Logie et al. (1998). Two manual material-handling activities (lifting and carrying and pushing and pulling) and five types of postures (standing, bending, stooping, neck postures [flexion, extension, and rotation], and reaching) were frequently observed during one-third or more of the shift for Canadian flight attendants with a high prevalence of musculoskeletal injuries. These findings suggest that exposure to manual material-handling activities and certain awkward or static work postures are likely to increase the risk of trunk work-related musculoskeletal disorders among female flight attendants on long-haul international flights. However, the actual tasks that put flight attendants at risk for work-related musculoskeletal disorders have not been identified. Be-

cause job tasks vary among individuals and the duration of a shift is relatively longer than the usual work shift (8 hours), job task measures through observation or direct measures such as biomechanical parameters were not feasible. Therefore, the use of self-reported measures with task-specific items is more appropriate in identifying job tasks that increase the risk for work-related musculoskeletal disorders among flight attendants than objective measures.

This focus group identified various physically strenuous job tasks related to manual material handling (e.g., carrying, lifting, pushing, and pulling). Handling both flight attendants' and passengers' carry-on baggage was mentioned as a strenuous and frequently performed task. Although the participants did not report the weight of carry-on baggage, the heavier the baggage, the greater the physical effort required. In a recent study of Korean flight attendants (Han, 2003), self-reported weight of objects was positively associated with low back pain, and the risk estimate increased with weight. Several airlines (e.g., American, Delta, and Northwestern) have a weight limit of 40 pounds or less for carry-on baggage (Engineered Packaging Solutions, 2005), but flight attendants might be required to handle materials that exceed the recommended weight limit of 51 pounds for females set by the revised NIOSH lifting equation (Waters, Putz-Anderson, & Garg, 1994). As expected, the participants agreed that handling carts was one of the most strenuous tasks, and they thought this task increased the occurrence of work-related musculoskeletal disorders. In Han's study (2003), the initial force required for pushing and pulling carts was between 12 and 35 pounds, which exceeded the acceptable maximum initial force of a push (Snook & Ciriello, 1991). In addition, flight attendants stated that handling duty-free items, coffee pots, and aircraft doors was also physically strenuous and should be included in the job task measure.

The focus group identified physically strenuous job tasks involving awkward or static postures including frequent bending, reaching, squatting, and standing. Most participants thought that frequent back bending during galley work and service (e.g., bending to put supplies in and take them from lower galley bins, and bending to put food in and take it from carts) increased their physical effort and subsequently the occurrence of work-related musculoskeletal disorders. These findings support prior flight attendant studies (Han, 2003; Logie et al., 1998). In Han's study, frequent back bending greater than 20° was found to be a risk factor for the occurrence of low back pain among Korean flight attendants. The awkward posture was frequently observed during beverage and food preparation and service among Canadian flight attendants (Logie et al., 1998). Other awkward postures required to perform several tasks (e.g., reaching to serve passengers in the window seat, reaching for items while kneeling, and squatting to take meal trays out of carts and return them) were mentioned as physically strenuous in this focus group. Although the flight attendants did not frequently perform certain tasks (e.g., reading pressure gauges) related to the safety check, the task was considered physically strenuous because of awkward postures (e.g., reaching, bending, and squatting). Also, uncomfortable postures during breaks (e.g., sleeping in bunk beds or passenger seats) and prolonged standing and walking were important and remained in the final list of physically strenuous job task items, suggesting the need to further examine them and determine whether there is a relationship between these postures and work-related musculoskeletal disorders.

STRENGTHS AND LIMITATIONS

Although using multiple focus groups (Morgan, 1996) from a homogeneous population (Caplan, 1990) has been suggested, in this study only one focus group was used. In this case, the focus group session was the final step in preparation for a survey with data used to assess job task content saturation and item clarity and was not the sole source of information for survey development. The focus group technique used an exploratory approach to acquire prescientific knowledge rather than a phenomenologic approach to see the world from the shared perceptions of particular respondents. According to Krueger and Casey (2000), the purpose of focus groups is not to make statements about the population or generalizations, but to provide valuable insights about how individuals perceive a situation. Likewise, the investigators intended to learn more about the range of their job tasks and gain information helpful in refining the survey from a limited number of target population members for the survey.

Practical concerns (time, cost, and availability of participants) (Knodel, 1993; Stewart & Shamdasani, 1990) made the use of multiple focus groups infeasible. In addition to limited budget, the time frame for the study was a consideration. Flight attendants are frequently out of the country on international flights and their work schedules vary. Thus, it was not easy to arrange a specific discussion time that would work for everyone.

However, given the nature of the discussion (job tasks), new information was not likely to be collected from additional focus groups because the participants had relatively extensive experience with the discussion topic and were able to share in detail. Also, inclusion of a junior in addition to more senior (five with more than 28 years of experience) flight attendants was beneficial for collecting enhanced data from different perspectives within a group (Kitzinger, 1995). For example, in response to a question about job security, flight attendants may consider the possibility of losing their job because of the company's need to downsize, whereas senior flight attendants had other reasons, such as individual abilities. In the end, the focus group provided valuable information that was incorporated into the survey.

SUMMARY

Occupational health nurses play a key role assessing potentially preventable and reducible risk factors for work-related musculoskeletal disorders. Self-reported measures are the most feasible method to use for flight attendants, who have variable job tasks and a unique

work environment. This focus group study was an essential step in finalizing the job task items to include in a survey to be administered to an occupational group that has scarcely been studied. The focus group, by providing information directly from flight attendants, contributed to integration of the workers' perspectives of their job tasks and work environment into the instrument. It was a highly successful method for modifying existing instruments that had been generated for different populations so that the survey would be appropriate for the target population in terms of content, wording, and phrasing. During the entire process, the collaboration with the union was extremely beneficial in bridging gaps between research and real-world experience, developing research strategies, and recruiting participants for the study.

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REFERENCES

Association of Flight Attendants–Communications Workers of America. (2004). *FAA-OSHA jurisdiction*. Retrieved November 20, 2004, from http://ashsd.afacwa.org/?zone=/unionactive/view_article.cfm&HomeID=1397.

Association of Flight Attendants–Communications Workers of America. (2005). *2005-2010 flight attendant agreement*. Retrieved June 1, 2005, from www.unitedafa.org/res/cba/default.asp

Ballard, T. J., Corradi, L., Lauria, L., Mazzanti, C., Scaravelli, G., Sgorbissa, F., et al. (2004). Integrating qualitative methods into occupational health research: A study of women flight attendants. *Occupational and Environmental Medicine, 61*(2), 163-166.

Bernard, B. P. (Ed.). (1997). *Musculoskeletal disorders and workplace flight attendants: A critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity, and low back* (DHHS [NIOSH] Publication No. 97-141). Cincinnati, OH: National Institute for Occupational Safety and Health.

Bernard, B. S., Sauter, S., Fine, L., Petersen, M., & Hales, T. (1994). Job task and psychosocial risk factors for work-related musculoskeletal disorders among newspaper employees. *Scandinavian Journal of Work, Environment, and Health, 20*(6), 417-426.

Bertrand, J., Brown, J., & Ward, V. (1992). Techniques for analyzing focus group data. *Evaluation Review, 16*(2), 198-209.

Bongers, P. M., De Winter, C. R., Kompier, M. A., & Hildebrandt, V. H. (1993). Psychosocial factors at work and musculoskeletal disease. *Scandinavian Journal of Work, Environment, and Health, 19*(5), 297-312.

Bureau of Labor Statistics. (2005). *Incidence rate and number of nonfatal occupational injuries by industry in 2003.* Retrieved May 15, 2005, from www.bls.gov/iif/oshwc/osh/os/ostb1347. pdf

Caplan, S. (1990). Using focus groups methodology for ergonomic design. *Ergonomics, 33*(5), 527-533.

Capodaglio, P. (2002). The use of subjective rating of exertion in ergonomics. *Giornale Italiano di Medicina del Lavoro ed Ergonomia, 24*(1), 84-89.

Conrad, K., Lavender, S., Reichelt, P., & Meyer, F. (2000). Initiating an ergonomic analysis: A process for jobs with highly variable tasks. *AAOHN Journal, 48*(9), 423-429.

Conrad, K. M., Balch, G. I., Reichelt, P. A., Muran, S., & Oh, K. (1994). Musculoskeletal injuries in the fire service: Views from a focus group study. *AAOHN Journal, 42*(12), 572-581.

Engineered Packaging Solutions. (2005). Airline baggage limitations. Retrieved May 15, 2005, from www.goeps.com/airline.aspx

Hagihara, A., Tarumi, K., & Nobutomo, K. (2001). The number of steps taken by flight attendants during international long-haul flights. *Aviation, Space, and Environmental Medicine, 72*(10), 937-939.

Han, H. M. (2003). *Development of low back pain prevention program for civil airline flight attendants*. Unpublished doctoral dissertation, Yonsei University, Seoul, Korea.

Haugli, L., Skogstad, A., & Hellesoy, O. H. (1994). Health, sleep, and mood perceptions reported by airline crews flying short and long hauls. *Aviation, Space, and Environmental Medicine, 65*(1), 27-34.

Haynes, S. N., Richard, D. C. S., & Kubany, E. S. (1995). Content validity in psychological assessment: A functional approach to concepts and methods. *Psychological Assessment, 7*(3), 238-247.

Iglesias, R., Gonzalez, G., & Morales, S. T. (1989). Occupational injuries suffered by flight attendants while on board. *Aviation, Space, and Environmental Medicine, 60*(11), 1109-1111.

Ing, S. Y., Ashbury, F. D., Marrett, L. D., From, L., & Perry, K. (2002). Use of focus group methodology in the development of an Ontario farmers' sun safety survey. *Chronic Diseases in Canada, 23*(2), 65-70.

Karasek, R. (1985). *Job content questionnaire and user's guide*. Lowell, MA: Department of Work Environment, University of Massachusetts-Lowell.

Kitzinger, J. (1995). Qualitative research: Introducing focus groups. *British Medical Journal, 311*(7000), 299-302.

Knodel, J. (1993). The design and analysis of focus group studies: A practical approach. In D. L. Morgan (Ed.), *Successful focus groups: Advancing the state of the art* (pp. 35-50). Newbury Park, CA: Sage.

Krueger, R. A. (1994). *Focus groups: A practical guide for applied research.* Thousand Oaks, CA: Sage.

Krueger, R. A., & Casey, M. A. (2000). *Focus groups: A practical guide for applied research.* Thousand Oaks, CA: Sage.

Kuorinka, I., Jonsson, B., Kilbom, A., Vinterberg, H., Biering-Sorensen, F., Andersson, G., et al. (1987). Standardized Nordic questionnaires for the analysis of musculoskeletal symptoms. *Applied Ergonomics, 18*(1), 233-237.

Lapostolle, F., Surget, V., Borron, S. W., Desmaizieres, M., Sordelet, D., Lapandry, C., et al. (2001). Severe pulmonary embolism associated with air travel. *New England Journal of Medicine, 345*(11), 779-783.

Loesch, L. C., & Vacc, N. A. (1993). *A work behavior analysis of professional counselors*. Muncie, IN: Accelerated Developments.

Logie, A., VanDerDoe, L., & Ryan, A. (1998). *Musculoskeletal injury prevention project: Report on the flight attendant group*. Richmond, BC: Workers' Compensation Board of British Columbia. Retrieved May 20, 2003, from www.worksafebc.com/aboutus/resources/library Services/online publications/wcb_research/assets/pdf/ 97FS-35.pdf

Lundberg, U. (1999). Stress responses in low-status jobs and their relationship to health risks: Musculoskeletal disorders. *Annals of the New York Academy of Sciences, 896*, 162-172.

Mergler, D. (1999). Combining quantitative and qualitative approaches in occupational health for a better understanding of the impact of work-related disorders. *Scandinavian Journal of Work, Environment, and Health, 25*(Suppl. 4), 54-60.

Messing, K., Seifert, A. M., & Escalona, E. (1997). The 120-second minute: Using analysis of work activity to prevent psychological distress among elementary school teachers. *Journal of Occupational Health Psychology, 2*(1), 45-62.

Morgan, D. (1996). Focus groups. *Annual Review of Sociology, 22*(1), 129-152.

Morken, T., Riise, T., Moen, B., Hauge, S., Holien, S., Langedrag, A., et al. (2003, September 4). Low back pain and widespread pain predict sickness absence among industrial workers. *BMC Musculoskeletal Disorders,* 4(21). Retrieved May 20, 2004, from www.biomedcentral.com/1471-2474/4/21

Nagda, N., & Koontz, M. (2003). Review of studies on flight attendant health and comfort in airliner cabins. *Aviation, Space, and Environmental Medicine, 74*(2), 101-109.

National Research Council, & Institute of Medicine. (2001). *Musculoskeletal disorders and the workplace*. Washington, DC: National Academy Press.

Needleman, C., & Needleman, M. L. (1996). Qualitative methods for intervention research. *American Journal of Industrial Medicine, 29*(4), 329-337.

O'Brien, K. (1993). Improving survey questionnaires through focus groups. In D. L. Morgan (Ed.), *Successful focus groups: Advancing*

the state of the art (pp. 105-118). Newbury Park, CA: Sage.
Palmer, K., Smith, G., Kellingray, S., & Cooper, C. (1999). Repeatability and validity of an upper limb and neck discomfort questionnaire: The utility of the standardized Nordic questionnaire. *Occupational Medicine, 49*(3), 171-175.
Pieren, A. (1997). *The working environment of aircraft cabins and its impact on the health of flight attendants*. Retrieved December 13, 2003, from www.strategiesforwellness.com
Rosecrance, J. C., Ketchen, K. J., Merlino, L. A., Anton, D. C., & Cook, T. M. (2002). Test-retest reliability of a self-administered musculoskeletal symptoms and job factors questionnaire used in ergonomics research. *Applied Occupational Environmental Hygiene, 17*(9), 613-621.
Sauter, S. L., & Swanson, N. G. (1996). An ecological model of musculoskeletal disorders in office work. In S. D. Moon (Ed.), *Beyond biomechanics: Psychosocial aspects of musculoskeletal disorders in office work* (pp. 3-21). London: Taylor & Francis.
Snook, S. H., & Ciriello, V. M. (1991). The design of manual handling tasks: Revised tables of maximum acceptable weights and forces. *Ergonomics, 34*(9), 1197-1213.
Stewart, D. W., & Shamdasani, P. N. (1990). *Focus groups: Theory and practice*. Newbury Park, CA: Sage.
United Airlines. (2001). *Job analysis*. Retrieved November 20, 2003, from www.unitedafa.org/committees/occupational/pk
U.S. Department of Labor. (1991). *The revised handbook for analyzing jobs*. Washington, DC: U.S. Government Printing Office.
U.S. Department of Labor. (2005). *Occupational outlook handbook, 2004-2005 edition, flight attendants*. Retrieved June 13, 2005, from www.bls.gov/oco/cg/cgs016.htm
Wahlstedt, K. G., Bjorksten, M. G., & Edling, C. (2001). Factors at work and musculoskeletal symptoms among postal workers. *International Journal of Behavioral Medicine, 8*(3), 181-193.
Waters, T., Putz-Anderson, V., & Garg, A. (1994). *Applications manual for the revised NIOSH lifting equation* (DHHS [NIOSH] Publication No. 94-110). Cincinnati, OH: National Institute for Occupational Safety and Health.
Whitaker, B., Soong, E., Terzis, G., & Yeh, W. (2005). *Stated preference as a tool to evaluate airline passenger preferences and priorities*. Paper presented at the annual meeting of the Transportation Research Board, Washington, DC. Retrieved August 10, 2005, from www.wilbursmith.com/WSA%20TRB%20Webpage/Stated%20Preference-Whitaker.pdf
Wilkie, D., Lovejoy, N., Dodd, M., & Tesler, M. (1990). Cancer pain intensity measurement: Concurrent validity of three tools—finger dynamometer, pain intensity number scale, visual analogue scale. *Hospice Journal, 6*(1), 1-13.