The Standardized Nordic Questionnaire Applied to Workers Exposed to Hand-Arm Vibration

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Abstract: The Standardized Nordic Questionnaire Applied to Workers Exposed to Hand-Arm Vibration: Orawan KAEWBOONCHOO, *et al.* Department of Hygiene, School of Medicine, Wakayama Medical University—

The standardized Nordic questionnaire (SNQ) is not yet widely used in Japan. This paper describes the possibility whether the SNQ, translated into Japanese, can be applied to workers exposed to hand-arm vibration. The musculoskeletal symptoms of 40 chain saw operators (CS) in private forests and 40 age-matched bush cleaner operators (BC) in the public service sector were assessed by the SNQ and the Japanese questionnaire (JQ). Both the SNQ and the JQ showed that CS had a higher prevalence of symptoms than BC. By the SNQ, there were significant differences in the prevalence of musculoskeletal symptom in the elbows, upper back and knees. By the JQ, CS had significantly higher prevalence of pain in the shoulders and elbows than BC. These results show the SNQ also fits the musculoskeletal symptoms and clearly differentiates between the prevalences in the two groups. The SNQ enables us to identify the severity, the duration, the treatment and the disability, but does not include items related to finger numbness and finger blanching. For that reason some JQ items should be applied to workers exposed to hand-arm vibration.

(*J Occup Health* 1998; 40: 218–222)

Key words: Standardized Nordic questionnaire, Hand-arm vibration, Musculoskeletal symptoms, Vibration syndrome

Prolonged exposure to hand-arm vibration can give rise to musculoskeletal disorders of the hand-arm, as well as neurological or vascular disorders. Musculoskeletal disorders are the initial or secondary symptom of the

hand-arm disorders caused by hand-arm vibration¹⁾. They are therefore important symptom for health surveillance. One of the most popular survey tools for detecting musculoskeletal disorders is the standardized Nordic questionnaire (SNQ). The SNQ was developed by a team of Nordic researchers organized to create a simple standardized questionnaire that could be used for the screening of musculoskeletal disorders as a part of ergonomic programs and for epidemiological studies of musculoskeletal disorders²⁾. But the SNQ is not yet widely used in Japan, particular in workers exposed to hand-arm vibration.

This paper outlines the possibility whether the SNQ, translated into Japanese, can be applied to workers exposed to hand-arm vibration.

Subjects and Methods

The subjects of this study were 40 male chain saw operators (CS) in private forests and 40 male age-matched bush cleaner operators (BC) in the public service sector in Wakayama Prefecture, Japan. The subjects' age ranged between 22 and 71 years. Mean age of CS and BC was 50 ± 14 years and 51 ± 15 years, respectively. Their mean length of the job experience was 20 ± 16 years in CS and 21 ± 12 years in BC.

The SNQ was translated into Japanese with cross checking. Physicians asked the subjects to assess musculoskeletal disorders by using the SNQ. It originally consists of a general questionnaire and a more detailed body part-specific questionnaire. The general questionnaire shows a body map diagram divided into nine anatomic regions and asks about the presence of physical troubles including ache, pain, discomfort etc., for the past 12 months and past 7 days in each of the body areas. It also includes grades of severity by using a measure of functional status: "Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of

Received Sept 29, 1997; Accepted Apr 21, 1998

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Table 1. Prevalence of pain in CS and BC by JQ

Body parts	CS (n=40)	BC (n=40)
neck	1 (3)	1 (3)
shoulders	15 (38)**	3 (8)
elbows	7 (18)*	1 (3)
wrists/hands	5 (13)	3 (8)
upper back	0 (0)	0 (0)
low back	8 (20)	4 (10)
hips/thighs	0 (0)	0 (0)
knees	2 (5)	1 (3)
ankles/feet	1 (3)	2 (5)

Percentage (%) given in parentheses. ** $p < 0.01$, * $p < 0.05$. CS: Chain saw operators. BC: Bush cleaner operators. JQ: Japanese questionnaire.

Table 2. Prevalence of 12-month and 7-day musculoskeletal symptoms in CS and BC by SNQ

Body parts	12-month		7-day	
	CS (n=40)	BC (n=40)	CS (n=40)	BC (n=40)
neck	10 (25)	4 (10)	7 (10)*	1 (3)
shoulders	20 (50)	16 (40)	13 (33)*	4 (10)
elbows	9 (23)**	1 (3)	6 (15)*	0 (0)
wrists/hands	4 (10)	1 (3)	0 (0)	1 (3)
upper back	6 (15)*	0 (0)	1 (3)	0 (0)
low back	24 (60)	16 (40)	8 (20)	3 (8)
hips/thighs	1 (3)	2 (5)	0 (0)	1 (3)
knees	8 (20)*	2 (5)	1 (3)	2 (5)
ankles/feet	2 (5)	4 (10)	1 (3)	2 (5)

Percentage (%) given in parentheses. ** $p < 0.01$, * $p < 0.05$. CS: Chain saw operators. BC: Bush cleaner operators. SNQ: Standardized Nordic questionnaire.

the trouble?" All answers are in the form of a dichotomous yes/no response. It took about 5 min to fill out the questionnaire.

Before the SNQ was carried out, all subjects were asked to answer the questions in the Japanese questionnaire (JQ) by self-administration. It took about 2 min to fill out the questionnaire. The JQ has been used to screen musculoskeletal disorders in workers exposed to hand-arm vibration in Japan (Appendix Table). This shows a body part diagram and asks about the prevalence of symptoms with a question: "Have you at anytime had pain in any parts of your body? ...yesno; if yes, please fill in the areas in the part of your body in which you have had pain". It also includes questions on duration, time of onset and severity as well as the symptoms of

Table 3. Prevalence of sick leave in CS and BC by SNQ

Body parts	CS (n=40)	BC (n=40)
neck	0 (0)	0 (0)
shoulders	3 (8)	0 (0)
elbows	3 (8)	0 (0)
wrists/hands	1 (3)	0 (0)
upper back	1 (3)	0 (0)
low back	5 (13)	1 (3)
hips/thighs	1 (3)	0 (0)
knees	1 (3)	1 (3)
ankles/feet	1 (3)	0 (0)

Percentage (%) given in parentheses. CS: Chain saw operators. BC: Bush cleaner operators. SNQ: Standardized Nordic questionnaire.

finger numbness and finger blanching.

The chi square test was used to analyze the difference in prevalence between CS and BC.

Results

1. The results of the JQ

The prevalences of pain are shown in Table 1. On the whole, CS had a higher prevalence of pain than BC. There were significant differences between prevalences of pain in the shoulders and elbows.

2. The results of the SNQ

The prevalences of 12-month and 7-day musculoskeletal symptoms are shown in Table 2. On the whole, the prevalences were higher in CS than in BC. Among the 12-month musculoskeletal symptoms, CS had a significantly higher prevalence in the elbows, upper back and knees than BC. Among the 7-day musculoskeletal symptoms, CS had significantly higher prevalence in the neck, shoulders and elbows than BC.

The prevalence of sick leave because of musculoskeletal symptoms in CS was not significantly higher than in BC (Table 3).

No difference was observed between CS and BC in the number of operators who had changed jobs, reduced work activity and leisure activity and who had been hospitalized because of musculoskeletal symptoms, but the number of operators who had seen a physician because of lower back and shoulders troubles was significant larger in CS than in BC (Table 4).

The prevalence of musculoskeletal symptoms in the lower back, neck and shoulders for more than 30 days was found to be higher in CS than in BC (Table 5). The CS experienced such trouble with low back, neck or shoulder pain by which they were unable to carry out

Table 4. Severity of troubles in low back, neck, or shoulders in CS and BC by SNQ

Severity	Low back troubles		Shoulders troubles		Neck troubles	
	CS	BC	CS	BC	CS	BC
	(n=40)	(n=40)	(n=40)	(n=40)	(n=40)	(n=40)
has seen doctor	9 (23)*	2 (5)	13 (33)*	4 (10)	3 (8)	1 (3)
reduced leisure activity	1 (3)	1 (3)	0 (0)	1 (3)	0 (0)	0 (0)
reduced work activity	2 (5)	1 (3)	1 (3)	0 (0)	0 (0)	0 (0)
hospitalized	2 (5)	5 (13)	NV	NV	NV	NV
changed jobs	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)	0 (0)

Percentage (%) given in parentheses. * $p<0.05$. CS: Chain saw operators. BC: Bush cleaner operators. NV: Not available. SNQ: Standardized Nordic questionnaire.

Table 5. Prevalence of troubles in lower back, neck, or shoulders for 0–30 days and more than 30 days in CS and BC by SNQ

	Low back troubles		Shoulders troubles		Neck pain troubles	
	CS	BC	CS	BC	CS	BC
	(n=32)	(n=25)	(n=22)	(n=15)	(n=12)	(n=5)
0–30 days	19 (59)	21 (84)	8 (36)	10 (67)	6 (50)	3 (60)
more than 30 days	13 (41)*	4 (16)	14 (64)*	5 (33)	6 (50)	2 (40)

Percentage (%) given in parentheses. * $p<0.05$. CS: Chain saw operators. BC: Bush cleaner operators. SNQ: Standardized Nordic questionnaire.

Table 6. Responses to the question "What is the total length of time that troubles in lower back, neck, or shoulders have prevented you from doing your normal work (at home or away from home) during the last 12 months?" in CS and BC by SNQ

	Low back troubles		Shoulders troubles		Neck troubles	
	CS	BC	CS	BC	CS	BC
	(n=23)	(n=15)	(n=20)	(n=14)	(n=10)	(n=4)
0 days	18 (78)	15 (100)	15 (75)	14 (100)	9 (90)	4 (100)
more than 0 days	5 (22)*	0 (0)	5 (25)*	0 (0)	1 (10)	0 (0)

Percentage (%) given in parentheses. * $p<0.05$. CS: Chain saw operators. BC: Bush cleaner operators. SNQ: Standardized Nordic questionnaire.

normal work either at home or away from home for one day or more more frequently than BC (Table 6).

Discussion

The CS in private forests typically have a longer exposure time to work than the BC in public service sector. The CS forestry jobs require muscular static activity to carry and operate their chain saws. A chain saw has a higher magnitude of vibration than a bush cleaner, and the operating time of a chain saw is longer.

The CS stand in a bending posture and repeatedly flex and extend their arms, so that the prevalence of musculoskeletal symptoms is higher in CS than in BC.

The JQ differentiated clearly between CS and BC in the prevalence of 2 symptoms. The SNQ also differentiated clearly between CS and BC in the prevalence of 3 symptoms. These results show that the SNQ also fits the musculoskeletal symptoms in workers exposed to hand-arm vibration.

Many researchers have linked the musculoskeletal

symptoms with exposure time to the work involving repetitive movements and the difference between workloads on individual body segments³⁻⁵). Considering the working conditions of CS, musculoskeletal symptoms in the neck, shoulders, elbows, back and knees should be frequent in CS. In this study, by means of the SNQ, the prevalences of 12-month musculoskeletal symptoms in the elbows, upper back and knees were significantly higher in CS than in BC. The prevalences of 7-day musculoskeletal symptoms in the neck, shoulders and elbows were higher in CS. By means of the JQ, the prevalences of pain in the shoulders and elbows were also significantly higher in CS than in BC. These correspond with the results of many studies on workers performing repetitive or sustained static work with their arms and hands⁶⁻¹⁰).

By means of the SNQ, the prevalences of 12-month musculoskeletal symptom in the shoulders was not significantly different for CS and BC, and that of 7-day musculoskeletal symptom in the shoulders was almost the same as with the JQ. This might be because BC could not recall symptoms in the past, in particular the symptoms of low severity. The prevalence of a symptom depends on its onset and the severity. Recent and more serious symptoms are apt to be remembered more than older and less serious ones²).

The SNQ enables us to identify the severity, the duration, the treatment and the disability. The number of operators who had seen a physician because of musculoskeletal symptoms was significantly larger in CS. The prevalence of long-lasting (more than 30 days) lower back, neck and shoulder troubles is higher in CS than in BC. The sick leave rate due to musculoskeletal symptoms was not significantly higher in CS than in BC, but it tends to be higher in CS. Sick leave of one day or more because of low back, neck and shoulder symptoms in CS is also higher than in BC. These results correspond with our hypothesis that the prevalence of musculoskeletal symptoms is higher in CS than in BC. This information either gives rise to further in-depth investigation or gives hints for decision-making on preventive measures. We can use the SNQ for a follow-up of the effects of improvements in the work environment.

The use of vibration hand tools elicits vibration syndrome including Raynaud phenomenon. Finger numbness is a typical symptom, and is precipitated by exposure to vibration and persists for progressively longer periods of time. Finger blanching is often the next symptom to occur with continued persistent exposure¹¹). Early diagnosis is important to prevent the progressive of the disease. In this study, with the JQ, the prevalences of pain, numbness and Raynaud phenomenon were 63%, 57% and 18% of the subjects, respectively. The number workers complaining of finger numbness is decreasing¹²), but it is still common, so the symptom of finger numbness

is important even now. The SNQ should take some items of the JQ to evaluate the symptoms of finger numbness and finger blanching to apply to workers exposed to hand-arm vibration. It should contain questions on the duration of the symptoms during the last 12 months. It should also contain questions on severity of the symptoms in terms of their effect on activities at work and during leisure time, and in terms of total duration of symptoms and sick-leave during the preceding 12 months.

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Appendix table. Questionnaire on subjective symptoms in vibration syndrome

Name.....

Date of birth:

year.....month.....day

Age: years old

Sex: Male / Female

Present address:.....

What do you belong to:

forest association / company / individual/

a fellow worker management / other

1. (past histories of diseases)
2. (past histories of injuries)
3. Have you at any time had numbness, tingling or dullness in the fingers, palms or feet?

(1) yes (2) no

If yes, please answer the following questions.

- (I) Please fill in the area in the part of your body in which you have had numbness.

- (II) When has it had occurred? (.....years ago)
- (III) In which season does it often occur?
 - a) spring b) summer c) fall d) winter e) any time
- (IV) How long does it continue in the season when it often occurs?
 - a) every day b) several times a week c) several times a month d) several times a year
- (V) Is it severer than before?
 - a) severer than before b) no change c) better than before
4. Have you at any time had white fingers or toes?
 - (1) yes (2) no

If yes, please answer the following questions.

 - (I) Please fill in the area in the part of your body in which you have had white fingers or toes.

- (II) When has it had occurred? (.....years ago)
- (III) In which season does it often occur?
 - a) spring b) summer c) fall d) winter e) any time
- (IV) How long does it continue in the season when it often occurs?
 - a) every day b) several times a week c) several times a month d) several times a year
- (V) Is it severer than before?
 - a) severer than before b) no change c) better than before

5. Have you at any time had pain in any part of your body? (1) yes (2) no

If yes, please answer the following questions.

- (I) Please fill in the area in the part of your body in which you have had pain.

- (II) When has it had occurred? (.....years ago)
- (III) In which season does it often occur?
 - a) spring b) summer c) fall d) winter e) any time
- (IV) When does it often occur during a day?
 - a) during work b) after work c) in the evening d) at night e) other (.....)
- (V) How long does the pain continue?
 - a) a long time b) about one week c) about one day d) about half a day e) about several minutes f) a moment
- (VI) Is the pain severer than before?
 - a) severer than before b) no change c) better than before
6. (cold sensitivity)
7. (general symptoms)
8. (disability in daily life)
9. Have you seen a doctor due to vibration syndromes?
 - (1) yes (2) no

If yes, please answer the following questions.

 - (I) Where did you see a doctor? (Name of the clinic or hospital)
 - (II) Which symptoms have you been treated?
 - (III) How have you been treated?
 - a) medicine b) injection c) surgery d) hot bath e) electric f) massage g) paraffin h) other (.....)
 - (IV) Was it better, after the treatment?
 - a) better b) no change c) worse