

Longitudinal Changes of Symptoms of Temporomandibular Disorders in Japanese Young Adults

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Longitudinal changes of symptoms of temporomandibular disorders in 275 Japanese university students were investigated through use of questionnaires in 1990 and in 1994. A comparison of the 1990 responses with the 1994 responses revealed that the prevalences of temporomandibular joint sounds, mouth opening restriction, and pain significantly increased from 28.7% to 49.8%, from 12.7% to 22.5%, and from 7.6% to 18.5%, respectively. The increase in the prevalence of symptoms mainly resulted for students who did not have symptoms of temporomandibular disorders at the first examination. Subjects who had been frequently aware of symptoms of temporomandibular disorders showed a tendency toward a decrease in their frequency of awareness. Although 66 students (24.0%) reported discomfort from symptoms of temporomandibular disorders during the period, only three (1.1%) visited medical facilities to receive treatment. These results suggest that symptoms of temporomandibular disorders evaluated through the use of questionnaires are longitudinally fluctuant, and that few students developed temporomandibular disorders.

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Epidemiologic studies have shown a high prevalence of symptoms and signs of temporomandibular disorders (TMD) in the nonpatient population. Some authors have suggested that more than one fifth of the population would require corresponding treatment,¹⁻⁵ but others have indicated that only about 5% would need treatment.^{6,7} This divergence has resulted from differences in criteria because the authors usually determine the necessity of treatment according to their concepts of TMD and clinical experiences with treating patients with TMD.

Common forms of TMD include internal derangement and osteoarthritis. Long-term follow-up studies have suggested that their natural courses consist of several consecutive stages leading to a depleted condition with few residual symptoms.⁸⁻¹⁰ Nevertheless, symptoms of TMD in nonpatients are related not only to joint problems but also to muscle problems, and they do not always develop into internal derangement or osteoarthritis.

Some longitudinal studies in nonpatient populations have suggested that TMD symptoms are fluctuant and may come and go in an unpredictable pattern.¹¹⁻¹⁸ However, most longitudinal studies of nonpatient populations have involved mainly children or mid-teenagers, so fluctuant characteristics could be a result of growth of the masticatory system or mental development. There is little infor-

Table 1 Awareness (Percentage of Subjects) of TMD Symptoms and Bruxism in 2,128 Students at the First Questionnaire*

	Subjects who answered both questionnaires (n = 275)	Subjects who answered only first questionnaire (n = 1,853)
TMJ sounds		
None	71.3	70.0
Rarely	15.6	15.5
Occasionally	8.0	8.0
Frequently	5.1	6.4
Opening restriction		
None	87.3	88.7
Rarely	9.1	7.2
Occasionally	2.5	2.9
Frequently	1.1	1.2
Opening pain		
None	92.4	90.2
Rarely	5.5	7.7
Occasionally	1.8	1.7
Frequently	0.4	0.4
Bruxism		
None	86.5	83.8
Rarely	11.3	12.1
Occasionally	2.2	3.5
Frequently	0.0	0.5

*No statistically significant difference in all symptoms between the two groups of subjects by chi square independent test.

mation regarding longitudinal changes in young adults, who are considered to be at high risk for TMD; the natural course of their TMD symptoms has not been adequately characterized. The aim of the present study was to examine longitudinal changes of TMD symptoms in young adults.

Materials and Methods

The first investigation for TMD symptoms using a questionnaire was conducted with 2,154 first-year university students in April 1990. The questionnaire contained four questions regarding TMJ sounds, mouth opening restriction, mouth opening pain, and bruxism. Each question was answered by selecting a frequency of awareness (none, rarely, occasionally, or frequently). Subjects completed the questionnaire after having had each question explained. A total of 2,128 students consisting of 1,340 men and 788 women with a mean age of 18.3 years (range 18 to 25 years) answered the questionnaire.

The second investigation was carried out with 410 students who were randomly selected from

among the respondents to the first questionnaire, in March 1994. The second questionnaire, along with explanations of the questions, was mailed to the subjects. This questionnaire consisted of six questions. Four questions regarding TMJ sounds, mouth opening restriction, mouth opening pain, and bruxism were the same as those in the first questionnaire. Two questions asked about experience of discomfort from TMD symptoms and treatment of TMD symptoms during the 4-year interval.

Of the 410 students who were sent the second questionnaire, 275 students, consisting of 195 men and 80 women, responded. Longitudinal changes of TMD symptoms were analyzed in these 275 students during the 4-year interval. Wilcoxon's signed rank test and the chi square independent test were used for analyses of the data.

Results

There was no statistically significant difference in the prevalence of awareness of TMD symptoms and bruxism between the 275 students who answered both questionnaires and the 1,853 participants who answered only the first questionnaire (Table 1).

The frequencies of each TMD symptom and bruxism obtained from the first and second investigations of the 275 students are shown in Fig 1. The frequencies of TMJ sounds, mouth opening restriction, and mouth opening pain significantly increased from 28.7% to 49.8% ($P < .001$), from 12.7% to 22.5% ($P < .01$), and from 7.6% to 18.5% ($P < .001$), respectively. The number of subjects who were occasionally or frequently aware of TMJ sounds in 1994 was two to three times the number in 1990. The number of subjects who were rarely aware of mouth opening restriction and pain increased. Bruxism also increased significantly from 13.5% to 28.7% ($P < .001$). There was no statistically significant difference in longitudinal changes in awareness of TMD symptoms between men and women.

Comparison of TMJ sounds between the two questionnaires showed that 53.0% of the subjects had no change in frequency of awareness, 36.4% had an increase, and 10.5% had a decrease (Table 2). No change in frequency of awareness of mouth opening restriction was found in 77.5% of the subjects. An increase was found in 16.3%, and a decrease in 6.1%. Most subjects who had been occasionally or frequently aware of restriction according to the first questionnaire showed a decrease in the frequency (Table 3). No change in frequency of awareness of mouth opening pain

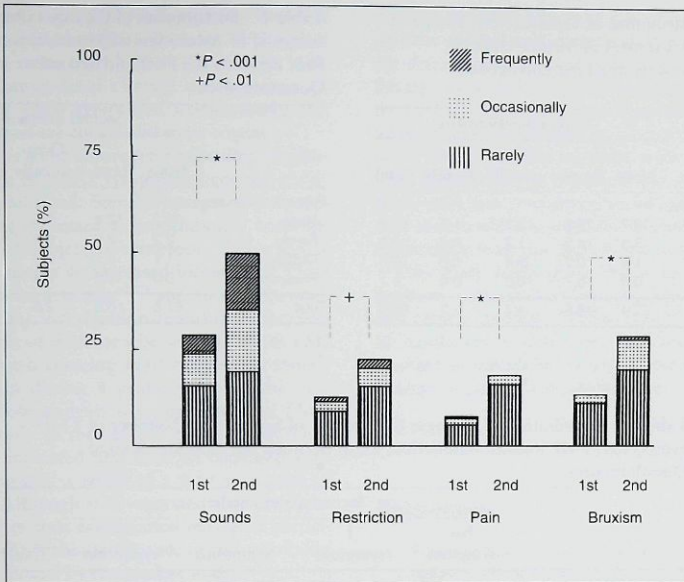


Fig 1 Frequencies of awareness of TMD symptoms and bruxism at the first and second examinations (P value by Wilcoxon's signed rank test).

was found in 81.1% of the subjects. An increase was found in 14.6%, and a decrease in 4.4%. All subjects who had been occasionally or frequently aware of pain according to the first questionnaire showed a decrease in the frequency (Table 4).

Changes in the number of symptoms are shown in Table 5. The prevalence of subjects who had no awareness of symptoms in either examination was 37.1%. In the first questionnaire, 65.2% of the subjects had no awareness of symptoms, compared with 44.4% in the second questionnaire. Only seven subjects (2.5%) were aware of all three symptoms in both questionnaires, and 52.3% showed no change in the number of symptoms between questionnaires. A total of 37.5% had an increase in the number of symptoms, while a decrease was found in 10.2%.

Sixty-six of the 275 students (24.0%) experienced discomfort from TMD symptoms during the 4 years. Comparisons between subjects with and without discomfort revealed statistically significant differences in awareness of TMJ sounds and mouth opening pain according to the first questionnaire (Table 6). However, 28 of the 66 students (42.4%)

Table 2 Distribution of Changes (Percentage of Subjects) of Awareness of TMJ Sounds Between the First and Second Questionnaires

	Second questionnaire				Total
	None	Rarely	Occasionally	Frequently	
First questionnaire					
None	43.6	12.0	8.4	7.3	71.3
Rarely	4.7	4.7	4.4	1.8	15.6
Occasionally	1.4	2.2	1.8	2.5	7.9
Frequently	0.4	0.4	1.4	2.9	5.1
Total	50.1	19.3	16.0	14.5	99.9

with discomfort were unaware of TMD symptoms as reported in the first questionnaire.

Of the 66 students with discomfort, only three (two men and one woman) had visited medical facilities to receive treatment. The two of these who had suffered from opening pain had been unaware of TMD symptoms at the first examina-

Table 3 Distribution of Changes (Percentage of Subjects) of Awareness of Mouth Opening Restriction Between the First and Second Questionnaires

	Second questionnaire				
	None	Rarely	Occasionally	Frequently	Total
First questionnaire					
None	72.7	10.2	2.9	1.4	87.2
Rarely	3.3	4.0	1.4	0.4	9.1
Occasionally	1.4	0.7	0.4	0.0	2.5
Frequently	0.0	0.7	0.0	0.4	1.1
Total	77.4	15.6	4.7	2.2	99.9

Table 4 Distribution of Changes (Percentage of Subjects) of Awareness of Mouth Opening Pain Between the First and Second Questionnaires

	Second questionnaire				
	None	Rarely	Occasionally	Frequently	Total
First questionnaire					
None	78.2	12.4	1.8	0.0	92.4
Rarely	2.2	2.9	0.4	0.0	5.5
Occasionally	1.1	0.7	0.0	0.0	1.8
Frequently	0.0	0.0	0.4	0.0	0.4
Total	81.5	16.0	2.6	0.0	100.1

Table 5 Distribution of Changes (Percentage of Subjects) of Number of TMD Symptoms (TMJ Sounds, Restriction, Pain) Between the First and Second Questionnaires

	Second questionnaire				Total
	No symptom	1 symptom	2 symptoms	3 symptoms	
First questionnaire					
No symptom	37.1	17.5	7.3	3.3	65.2
1 symptom	6.2	10.9	5.1	2.5	24.7
2 symptoms	1.1	1.4	1.8	1.8	6.1
3 symptoms	0.0	0.4	1.1	2.5	4.0
Total	44.4	30.2	15.3	10.1	100.0

Table 6 Percentages of Awareness of Symptoms at the First Questionnaire in Subjects With and Without Discomfort from TMD Symptoms

	TMJ sounds	Opening restriction	Opening pain	Bruxism
Subjects with discomfort (n = 66)	43.9*	15.1	20.0**	13.6
Subjects without discomfort (n = 209)	23.9	12.0	3.8	13.4

* $P < .01$ by chi square independent test.** $P < .001$ by chi square independent test.

tion. They were successfully treated by analgesics. The other, who suffered from TMJ sounds, had been aware of only TMJ sounds as reported in the first questionnaire, and she received orthodontic treatment for her malocclusion.

Discussion

The advantages and disadvantages of the questionnaire as a method for evaluating subjective symptoms have been discussed in several studies.¹⁹⁻²³ The main advantage of its use is elimination of the examiner's influence on participants' responses. Accordingly, questionnaires are often used to investigate longitudinal changes in subjective symptoms. However, results obtained from questionnaires are affected by various factors such as dropouts, noncooperation, and misinterpretations of the questions. In this study, although the second evaluation was conducted by mail, most of the questions were the same as in the first questionnaire, and explanations were provided to minimize misunderstandings. It is commonly suggested that those with severe symptoms tend to respond more readily to such questionnaires. However, there was no statistically significant difference in the preva-

lence of awareness of TMD symptoms between our subjects and the other students at the first examination; more than half of the subjects indicated no longitudinal change in frequency of awareness of TMD symptoms. Consequently, the results obtained are considered to be cogent.

There exists some controversy regarding longitudinal change in TMD symptoms between childhood and adulthood. Some investigations of adolescents have indicated a longitudinally constant prevalence of subjective symptoms,^{15,18} whereas others have shown an increased incidence of TMD symptoms in adolescents,^{12,13} and an increase with age.^{14,16,17} Our investigation revealed an increase in the number of students who were aware of TMJ sounds, mouth opening restriction, and mouth opening pain during 4 years; this was the case mainly in those students who were aware of TMD symptoms only at the second investigation. Dibbets et al¹² indicated that such an increased incidence was mostly a result of a new awareness of symptoms. Although it is suggested that the experience of a previous examination may alert participants to TMD,²⁴ the significance of this possibility was not confirmed by the present study.

Students who were aware of TMD symptoms at the first examination showed various changes in their awareness of symptoms after 4 years. Students who had a low frequency of awareness of TMD symptoms showed a tendency toward an increase of awareness; most students who initially had a high frequency of awareness showed a decrease over the 4 years. These results suggest that TMD symptoms in young adults are not consistent but fluctuant, as has been previously reported for younger populations.¹²⁻¹⁸

In our study, 24.0% of the students experienced discomfort from TMD symptoms during the investigated period. The incidence was similar to that of the nonpatient population for whom necessity of treatment has been indicated in previous reports.¹⁻⁵ Magnusson et al⁵ reported that frequent TMJ sounds and pain were common in the group for which functional treatment was judged to be necessary. Our subjects with discomfort from TMD symptoms were more frequently aware of TMJ sounds and pain than were those who did not experience discomfort at the first evaluation. Consequently, screening for awareness of TMD symptoms might be useful, to some extent, in detecting subjects who would eventually be bothered by TMD symptoms. However, only three subjects (1.1%) sought treatment for their symptoms in our investigation, and two of them had had no TMD symptom at the first examination. Although

it is not clear why most of our subjects with discomfort did not seek treatment, it is believed that the discomfort may have been transient or a self-limiting condition, because fluctuant characteristics of TMD symptoms have been indicated in previous studies. Schiffman et al⁷ reported that the main reason nursing students with TMD symptoms had not sought treatment was that the symptoms were not considered to be a problem, and that they could live with the symptoms. Such an explanation may also apply to our results.

This study could not evaluate the relationship between subjective changes in TMD symptoms and clinical findings. Further clinical study should be conducted to determine whether longitudinal changes in subjective symptoms are supported by changes in clinically evaluated signs.

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Resumen

Cambios Longitudinales de los Síntomas de Desórdenes Temporomandibulares en Adultos Jóvenes Japoneses

Se investigaron los cambios longitudinales en los síntomas de desórdenes temporomandibulares (DTM) en 275 estudiantes universitarios japoneses, por medio de cuestionarios en 1990 y 1994. Al comparar las respuestas de 1990 con las de 1994 se detectó que las prevalencias de los sonidos de la articulación temporomandibular, la restricción de la apertura bucal, y el dolor aumentaron significativamente de 28,7% a 49,8%, de 12,7% a 22,5%, y de 7,6% a 18,5%, respectivamente. El aumento en la prevalencia de los síntomas resultó principalmente de estudiantes que no tenían síntomas de DTM en el examen inicial. Las personas que habían estado frecuentemente conscientes de los síntomas de los DTM mostraron una tendencia a ignorarlos. Aunque 66 estudiantes (24%) reportaron molestias originadas por síntomas de DTM durante el periodo, sólo tres (1,1%) visitaron los servicios médicos para recibir tratamiento. Estos resultados indican que los síntomas de DTM evaluados a través del uso de cuestionarios fluctúan longitudinalmente, y que la progresión de tales síntomas es leve.

Zusammenfassung

Longitudinale Veränderungen von Myoarthropathiesymptomen bei japanischen jungen Erwachsenen

Mittels Fragebögen wurden bei 275 japanischen Studenten 1990 und 1994 longitudinale Veränderungen bei Myoarthropathiesymptomen untersucht. Die Prävalenz von Kiefergelenksgeräuschen stieg zwischen 1990 und 1994 signifikant von 28,7% auf 49,8%, diejenige von Mundöffnungsbehinderungen von 12,7% auf 22,5% und diejenige von Schmerzen von 7,6% auf 18,5%. Dieser Anstieg lag vor allem im Auftreten von Symptomen bei Studenten begründet, welche bei der ersten Befragung keine Symptome angaben. Studenten, welche oft Symptome bei sich beobachtet hatten, zeigten eher eine Erniedrigung in der Frequenz des Auftretens. Obwohl 66 Studenten (24%) eingeschränktes Wohlbefinden durch Myoarthropathiesymptome angaben, nahmen in der Periode von 1990 bis 1994 nur 3 (1,1%) deswegen ärztliche Hilfe in Anspruch. Diese Resultate legen nahe, dass die Evaluation von Myoarthropathiesymptomen durch die Hilfe von Fragebögen longitudinal fluktuieren und dass der Verlauf der Erkrankung bei Patienten mit Myoarthropathien mild ist.