

The Incidence of Hand Problems in Music Students

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The musculoskeletal problems of instrumental musicians have been described in several recent articles.¹⁻⁷ However, our understanding of this group of occupational disorders remains incomplete. The studies published to date have been limited by one or both of the following factors: lack of knowledge regarding the population from which the affected musicians were drawn (the "denominator")^{1-3,7} and the inability to follow a defined group of musicians over a period of time.³⁻⁶ Thus, while some authors have been able to report the prevalence (number of cases per 100 musicians at a single point in time) of musculoskeletal injuries in the population studied,⁴⁻⁶ no data are available to describe the incidence (number of new cases per 100 musicians per year) of musculoskeletal injuries. This article reports the incidence of upper extremity problems brought on by playing an instrument among students at one university-level music school.

Patients and Methods

All full-time students at this university-level music school participate in a pre-paid health care plan which covers the cost of visits to the health service itself; the students are expected to obtain health insurance to cover laboratory and hospitalization costs. Part-time students may be seen on a fee-for-service basis. Primary care is provided by nurses and internists, who have an office at a convenient location on campus. Referral is available to nearby consultants in all medical specialty areas. A diagnostic code is entered into a computerized data base for each visit.

The clinical data for this study were obtained by reviewing the charts of all music students seen for upper extremity musculoskeletal problems during the four academic years 1982-83 through 1985-86. Only problems brought on by performance are included in this report. When an individual student had several visits for a problem in the same anatomic location, the author decided whether this represented one or several "episodes," based on clinical information and the time span involved. Data regarding the gender and instrument of the instrumental performance majors were obtained from the school's computerized registration information system and from the Registrar's office.

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Data were analyzed using the Poisson distribution. The calculations were performed by a microcomputer-based statistics program.⁸ Group data are summarized as the mean and the range.

Results

During the four years of the study, 132 students were seen for 183 hand problems related to the instrument(s) they played: 44 men were seen for 59 episodes and 88 women were seen for 124 episodes. Their average age was 21.5 years with a range of 17 to 39 years. Approximately equal numbers of freshmen, sophomores, juniors, seniors and graduate students were affected. Eighty percent had had symptoms for 5 weeks or less; two had been symptomatic for over two years. The month that had the most presentations for care was September, although more students presented in the spring semester than in the fall semester (Fig. 1). The duration of symptoms of those presenting in September was no different from that of the students presenting in other months. Keyboard and string players accounted for the majority of cases, with fewer woodwind, brass and percussion players affected (Table 1). The sites of hand problems are described in Table 2, showing a predominance of left-sided problems in violin and viola players and essentially equal numbers of right- and left-sided problems in the other groups.

Pain was the most common symptom at presentation (163 episodes), with stiffness, tingling and/or tightness present in 14, 14 and 12 episodes, respectively. Swelling, fatigue, weakness, or cramp were reported fewer than 10 times each.

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Month	Number of Episodes
January	14
February	29
March	26
April	19
May	2
June	3
July	2
August	0
September	35
October	17
November	16
December	10

FIGURE 1. Episodes of Hand Problems by Month

TABLE 1. Episodes of Hand Problems by Instrument

Instrument Category	Total Episodes	Instrument	Number of Episodes
Keyboard	75	Piano	66
		Organ	9
Strings	71	Violin	39
		Viola	14
		Cello	12
		Bass	6
Woodwinds	25	Flute	10
		Oboe	8
		Clarinet	4
		Bassoon	3
Brass	9	Trombone	3
		Trumpet	2
		Horn	4
Others	25	Harp	9
		Percussion	4
		Misc	12
Total*	205		

* The total number of instruments reported exceeds the number of episodes because some students reported playing more than one instrument.

Most students presented with pain as a major symptom, with fewer reports of stiffness, tightness, tingling, and other symptoms.

One hundred five episodes were felt to be due to overuse syndrome; in 47 of these cases tenderness or other physical findings were present on examination. Tendinitis was diagnosed in 49 students, 24 of whom manifested physical signs. In 15 students other diagnoses were made, including epicondylitis (8 cases), peripheral nerve injury (3), cervical disc disease (2), and joint capsule sprain (2); there were physical findings in all 15. In 14 cases no diagnosis was made.

The incidence of hand problems over the four years was 8.5 episodes per 100 performance majors per year, ranging from 5.5 to 11.5. The incidence figures for men and women were 5.7 (2.4 to 8.0) and 11.5 (9.0 to 15.6), respectively. The difference between the incidence rates for men and women is statistically significant at the 0.05 level (Table 3).

The incidence rates were calculated for keyboard, string and wind instrument performers. Keyboard and string musicians were more likely to be affected (13.2 episodes, range 7.1 to 18.0; and 9.6 episodes, range 4.8 to 15.4; per 100 performance majors per year, respectively), and wind instrument players were less likely to be affected (3.9, range 3.3 to 4.6); the difference between string and wind performers is significant at the 0.05 level (Table 4).

Discussion

When comparing the results of this study with the results of other studies in the literature, one must keep in mind the characteristics of the population, the health care system involved, and the study design. The subjects of this study are younger and earlier in their musical careers than are the subjects of most other studies in this field. In addition, they have access to a pre-paid health care plan with an on-campus office staffed by nurses and physicians who are interested in performing arts medicine. Equally important, the faculty and administration of this school maintain an enlightened approach to performance-related health problems. Finally, the fact that this is a longitudinal study of a defined population makes it different from survey studies and previous clinic-based studies.

The students' hand problems are generally less severe and of shorter duration than those reported in studies of older groups of musicians.^{1,3,4} Direct comparison with the Australian music students surveyed by Fry⁶ is difficult due to differences in study design, but the duration of symptoms appears to be shorter in our students (80% < 5 weeks) than in the Australian students (9% < 4 weeks).

TABLE 2. Site of Hand Problems by Instrument

	Piano and Organ		Violin and Viola		Cello and Bass		Woodwinds			
	R	L	R	L	R	L	R	L		
Hand and wrist	16	14	4	17	7	3	7	1	69	46%
Forearm	6	8	3	8	0	3	4	3	35	23%
Elbow	6	4	1	4	2	0	0	0	17	11%
Shoulder	3	5	3	8	1	1	2	1	24	16%
Unspecified	1	2	0	1	1	0	0	0	5	3%
TOTAL*	32	33	11	38	11	7	13	5	150	

* The total number of sites is greater than the total number of episodes for these instruments because many patients had more than one symptomatic site.

TABLE 3. The Incidence of Hand Problems by Gender*

	1982-83	1983-84	1984-85	1985-86	Total
Male	5/213 2.4	16/209 7.7	10/210 4.8	17/212 8.0	48/844 5.7
Female	17/189 9.0	25/200 12.5	18/194 9.3	28/179 15.6	88/762 11.5
All	22/402 5.5	41/409 10.0	28/404 6.9	45/391 11.5	136/1606 8.5

*In the top line of each section, only the episodes occurring in performance majors were used to calculate the numerators; the denominators are the number of performance majors. The bottom row of each section shows the number of episodes per 100 performance majors.

TABLE 4. The Incidence of Hand Problems by Instrument*

	1982-83	1983-84	1984-85	1985-86	Total
Keyboard	6/84 7.1	16/89 18.0	8/81 9.9	14/80 17.5	44/334 13.2
String	7/145 4.8	17/147 11.6	10/149 6.7	22/143 15.4	56/584 9.6
Wind	5/148 3.4	5/150 3.3	7/151 4.6	6/145 4.1	23/594 3.9

*The numbers are arranged as in Table 3; the totals do not match because 13 episodes occurring in instruments such as the harp and percussion are not included in this table.

The results of this study agree reasonably well with those of other studies with respect to the site and side of the problem. Approximately half of the episodes in this study involved the hand and/or wrist; the remainder involved other parts of the arm. Hochberg et al.¹ reported that 65% of the patients they saw had hand or wrist symptoms, whereas other authors report figures in the 40 to 50% range.^{3,4,6,7} The findings concerning laterality differ slightly from the report of Knishkowsky and Lederman:² the left-sided predominance existed only for violin and viola players, not for all string players; and keyboard musicians appeared to have an equal likelihood of right- and left-sided problems in this population. The woodwind instrumentalists in this study appeared to have more right- than left-sided symptoms, but the difference was not statistically significant.

Similar to the findings of Hochberg et al.¹ and of Knishkowsky and Lederman, most students presented with pain as a major symptom, with fewer reports of stiffness, tightness, tingling, and other symptoms. No clinical severity grading system was in use during the four years covered by this study, so direct comparison with Fry's reports^{3,4,6} is not possible. However, the author's own experience at this institution is that most cases are Grades 1, 2, or 3, with an occasional Grade 4 and very few, if any, Grade 5s. Approximately half the students had tenderness or other physical findings whether they had overuse syndrome or "tendinitis." This suggests that many of those diagnosed as having "tendinitis" may have had Fry's Grade 1 or 2 overuse syndrome.³

The fact that this study is school-based makes examination of two factors interesting: the class and month of presentation of those affected. With nearly equal numbers

of freshmen, sophomores, juniors, seniors and graduate students affected (adjusting for the larger graduate student population), it seems unlikely that the educational process itself is promoting the occurrence of hand problems; if it were, one would expect to see a steady increase during the undergraduate and graduate years. The pattern during the academic year does show that more students presented for care during the spring semester than during the fall semester. This may be related to preparation for juries, with a concomitant increase in practice time, practice intensity, and stress. It was surprising to find that the peak incidence month was September. Two possible explanations come to mind. Students may develop hand problems during the summer while away from the pre-paid health care plan and wait until they return to seek help. Alternatively, they may not play as much or as intensively during the summer, and then escalate their practice schedule when classes resume. Since the duration of symptoms of those presenting in September was no different from those presenting during the rest of the year, the first hypothesis seems very unlikely. Many students do attend summer music programs, but no information is available comparing practice patterns at and away from school.

The prevalence rates reported by Fry^{4,6} were the first epidemiologic data available in this field. He found that 42 to 64% of symphony orchestra members had overuse syndrome at the time of a survey,⁴ and that five to 13% of music students surveyed had overuse syndrome at the time.⁶ This study reports for the first time the incidence rates in a group of musicians: approximately 8 new cases developed each year per 100 instrumental musicians, with a range of 5.4 to 11.5 cases per 100 musicians per year. The incidence of hand problems in women was about twice as high as that in men. This is consistent with Fry's report⁶ that the prevalence of overuse syndrome among female music students in Australia was higher than that of men. The reasons for this remain unknown. Fry³ has suggested three basic causal factors: genetics, technique, and intensity \times practice time. Men and women have obvious genetic differences, but acquired biological factors may play an equally important role. Both prior injuries (caused by playing the instrument or not) and prior training should be taken into account. It is possible that men's greater upper body strength (to some extent genetic and in some cases augmented by training) may lend some protection against overuse syndrome. One could hypothesize that at least some women could lower their risk of hand problems by doing upper body exercise.

The results of this study show for the first time a statistically significant difference in episodes of pain among the various instrument groups. Several factors may explain why pianists and organists should have a relatively high rate of hand problems. Keyboard performers, as well as violinists, violists and cellists, have a very large repertoire to learn.

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Another possible explanation, suggested to me by a student, is that the pianists have to play more hours per week than do other students because of their accompanist responsibilities. The lower rates among wind instrument performers may be related to the smaller repertoire for most of those instruments or to the development of embouchure problems prior to the development of upper extremity problems.

Some caution must be exercised in interpreting the results of this study. We do not know how many students sought help for a hand problem outside the pre-paid student health plan. To the extent that they did so without contacting us in any way, the incidence rates reported here are underestimates. As in any retrospective study, information collection is imperfect and in some cases incomplete. Several internists saw these patients, and in most cases information on the time until resumption of normal playing is not available. Prospective data collection with a standardized history and physical examination and planned follow-up would overcome most of these deficiencies. Finally, the small numbers in some subgroups make it impossible to separate the effects of gender from instrument.

Conclusions

Approximately 5 to 11% of performance majors at one university music school developed hand problems each year

during a four-year period. Women appeared to be at greater risk than men; keyboard and string performers seemed to be at greater risk than other instrumentalists. Further study should be directed at confirming and explaining these results prospectively, and at developing effective preventive and therapeutic strategies for this group of occupational disorders.

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