Health Problems of Clarinetists: An Epidemiologic Survey

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Introduction

Instrument-specific epidemiologic research informs PAM professionals about the occupational health patterns experienced by musicians. Of the 55 known epidemiologic studies that included clarinetists, sample sizes were often small, subjects were typically orchestral musicians, and clarinetists were often grouped together with other woodwind instrumentalists. One large-scale study, exclusively for clarinetists (N=324), relied on the Hunter Fry Scale to characterize impact of pain and did not include all musculoskeletal sites important to clarinet playing including individual fingers/digits, mouth area (inside of upper and lower lips), and nasal area.[1] Technological and survey advancements including the modification of the Athletic Identity Measurement Scale (AIMS), known as Musician Identity Measurement Scale (MIMS).[2] Additionally, athletes who score higher on the AIMS tend to exhibit lower-self esteem and are more at risk for symptoms of depression when their perceived identity does not correspond with an expected athletic outcome.[3]

This previous clarinet study was also completed prior to published research demonstrating the biomechanical load-reducing impact of clarinet neck strap.[4,5] Additionally, this study neglected to assess attitudes about using assistive aids (ie. neck strap, tooth guard) as tools for pain management while playing the clarinet. While this previous clarinet-specific study referenced the "No Pain, No Gain" sentiment, the study did not directly ask participants about their reaction to this view point. Research from David Shoup (1995) surveyed 425 high school and junior high musicians; his findings showed that an alarmingly high 44.0% answered "yes" when asked whether they believed in "No Pain, No Gain."[6] There is no known research that indicates how clarinetists view this idea.

Therefore, the purpose of this study was to characterize clarinet-specific health problems such as site-specific pain, performance anxiety, and related variables including attitudes toward "No Pain, No Gain," instrument type, use of neck strap, educational attainment, musician identity, and other lifestyle and performance-related factors.

Specific Aims:

1. Analyze and compare clarinet-related musculoskeletal pain through site-specific body maps.
2. Explore influence, intensity, frequency, and quality of pain among the most prevalent musculoskeletal sites associated with learning and performing the clarinet.
3. Examine attitude towards, use, effectiveness of assistive aids (ie. neck strap, tooth guard) and "No Pain, No Gain" sentiment.

Method

An online survey specifically for clarinetists was developed using techniques adopted from a recent study of trombonists (interactive body maps, skip logic, etc.).[6] As seen in Figure 1, detailed hand maps were included in the survey to differentiate between site-specific (top row) and diffuse (middle row). Additional advancements allowed participants to indicated pain inside the mouth and lips (bottom left), outer lips (bottom middle), and nasal cavity (bottom right). This study also asked participants to describe the frequency, intensity, influence, and quality of pain for each body site they indicated having pain in during the past year. Clarinetists were asked to select sites on a body map where they had experienced clarinet-related pain in the past year. Survey participants were asked to detail the quality of their pain by using a variety of sensory, evaluative, and affective terms. Additional questions were asked about non-musculoskeletal problems, assistive aids (Figure 2), musician identity, and "No Pain, No Gain." IRB approved recruitment protocols that included email announcements directly to clarinet faculty (NASM Schools of Music) and social media posts on clarinet-specific platforms. Data analyses involved descriptive, comparative, and correlation statistics.

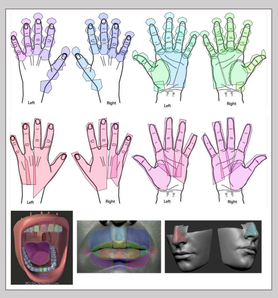

Figure 1: Body Maps

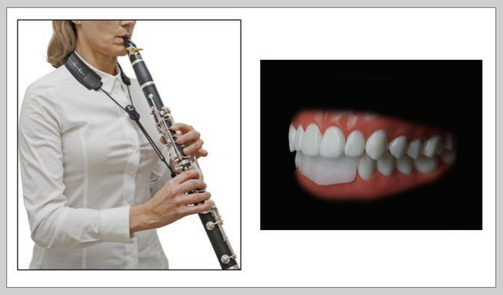

Figure 2: Clarinet Neck Strap (Left) and Tooth Guard (Right)

Results

This web-based survey yielded N=350 total respondents. As shown in Table 1, female respondents represented 62.3% and males represented 37.1% of the participants. The vast majority of clarinetists report right handedness, fewer are left handed and even fewer are ambidextrous. In general, this population of clarinetists reports exercising regularly, mostly participating in cardiovascular activities. Survey participants reported a mean playing the clarinet for more than 20 years and formally studying the instrument for 10 or more years.

Variables	Total	Male	Female
Sex N (%)	350	131 (37.4)	219 (62.6)
Age (yrs) mean ± SD	34.19 ± 15.23	35.76 ± 16.72	33.26 ± 14.22
Handedness N (%)			
Right	288 (82.29)	108 (30.86)	180 (51.49)
Left	43 (12.29)	15 (4.29)	28 (8.00)
Ambidextrous	19 (5.42)	8 (2.29)	11 (16.67)
Weight (lbs) (mean ± SD)	163.56 ± 45.91	175.14 ± 40.06	156.63 ± 47.85
Exercise (hrs. per week)			
Cardiovascular	2.89±4.31	2.72 ± 2.83	2.99 ± 4.99
Resistance	1.39±2.98	1.37 ± 2.41	1.41 ± 3.29
Flexibility	1.27±3.19	0.95 ± 1.61	1.46± 3.85
Engagement (mean ± SD)			
Playing clarinet (yrs.)	21.51 ± 14.26	22.51 ± 15.37	20.92 ± 13.57
Formal study clarinet (yrs.)	10.36 ± 9.26	11.31 ± 12.83	9.80 ± 6.20
Playing Eb clarinet (hrs. per week)	0.93 ± 3.25	1.14 ± 4.52	0.80 ± 2.16
Playing Bb/A clarinet (hrs. per week)	16.75 ± 44.19	18.82 ± 34.32	15.84 ± 49.20
Playing Bass clarinet (hrs. per week)	1.24 ± 3.49	1.44 ± 3.45	1.11 ± 3.52

Table 1: Demographics

As shown in Table 2, this group of clarinetists report elevated levels of occupational identity. These results are reflected in this population's commitments to formal clarinet study and hours spent playing the clarinet each week. Additionally, this population has spent more than half of their lives playing the instrument.

Musician Identity Measurement Scale (MIMS) Scores for Clarinetists

MIMS* Items	Mean (± SD)	Max
1) I consider myself a musician	6.60 ± 9.84	7
2) I have many goals related to music	6.31 ± 1.28	7
3) Most of my friends are musicians	5.74 ± 1.60	7
4) Music is the most important part of my life	5.41 ± 1.55	7
5) I spend more time thinking about music than anything else	4.98 ± 1.75	7
6) I need to participate in music to feel good about myself	5.07 ± 1.80	7
7) Other people see me mainly as a musician	5.45 ± 1.63	7
8) I feel bad about myself when I do poorly at music	5.82 ± 1.54	7
9) Music is the only important thing in my life	2.92 ± 1.74	7
10) I would be very depressed if I were injured and could not participate in music	5.47 ± 1.77	7
Total MIMS	53.67 ± 10.84	68.00
Social Identity	17.79 ± 3.48	21.00
Exclusivity	19.52 ± 4.95	21.00
Negative Affectivity	16.36 ± 4.24	28.00

*Musician Identity Measurement Scale (MIMS) is adapted from the Athletic Identity Measurement Scale (AIMS) (Brewer, 1993). Each item uses a 7-point scale of agreement. The total MIMS score is the sum of all individual items. The subscale score for Social Identity is the summation of means for questions 1, 3, and 7. In the same manner, Exclusivity was calculated for questions 2, 4, 5, and 9, and Negative Affectivity for questions 6, 8, and 10.

Table 2: Musician Identity Measurement Scale (MIMS) Results

Lip and Mouth Regions Right Thumb and Wrist

Musculoskeletal Site	Prevalence Rank	Prevalence n (%)	Frequency Rank	Frequency Mean ± SD	Intensity Rank	Intensity Mean ± SD	Influence Rank	Influence Mean ± SD
Inside Bottom Lip	1	120 (34.3)	4	53.40 ± 28.6	1	46.8 ± 27.6	1	45.0 ± 33.5
Right Thumb MP Joint (Dorsal)	2	98 (28.0)	22	42.06 ± 28.2	17	33.7 ± 24.7	12	29.6 ± 27.9
Right Thumb IP Joint (Dorsal)	3	92 (26.3)	13	45.5 ± 29	15	35.0 ± 25.3	10	30.0 ± 30.1
Right Thumb Radial Nerve (Dorsal)	4	81 (23.1)	2	55.6 ± 29.8	3	44.1 ± 26.8	3	39.2 ± 34.4
Right Neck Back	5	80 (22.9)	9	47.1 ± 28.6	9	39.1 ± 25.1	22	23.7 ± 28.5
Right Forearm Front	6	79 (22.6)	23	39.9 ± 27.5	24	30.8 ± 25.3	16	26.7 ± 27.2
Left Neck Back	7	74 (21.1)	10	47 ± 28	10	38.9 ± 26.3	19	24.0 ± 28.5
Right Thenar	8	73 (20.9)	5	50.7 ± 34	11	38.5 ± 28.9	9	31.3 ± 28.7
Right Wrist Front	9	66 (18.9)	21	42.2 ±30.4	19	33.2 ± 26.4	14	28.7 ± 27.8
Right Upper Back	10	66 (18.9)	6	50.1 ±26.5	7	39.7 ± 22.1	25	21.8 ± 24.3
Right Thumb Median Nerve (Palmer)	11	66 (18.9)	3	54.6 ±28.6	2	46.3 ± 27.1	2	41.8 ± 32.2
Center Bottom Lip (Vermilion)	12	62 (17.7)	15	44.7 ± 28.3	27	27.8 ± 23.5	13	29.5 ± 26.3
Left Upper Back	13	61 (17.4)	12	46 ± 27.5	12	37.8 ± 24.8	24	22.7 ± 26.8
Right Forearm Back	14	53 (15.1)	27	33.2 ± 24.7	25	30.3 ± 21.8	21	23.9 ± 26.0
Right Thumb CMC Joint (Dorsal)	15	51 (14.6)	17	43.1 ± 27.5	16	34.1 ± 24.7	8	33.5 ± 27.6
Right Wrist Back	16	49 (14.0)	25	39.1 ± 29.7	21	31.9 ± 28.5	17	26.6 ± 30.1
Center Cutaneous Lower Lip	17	48 (13.7)	20	42.4 ± 28.5	20	32.4 ± 23.1	11	29.9 ± 27.0
Right Shoulder Back	18	47 (13.4)	8	48.5 ± 30.4	8	39.3 ± 27.1	23	23.5 ± 27.3
Left Shoulder Back	19	42 (12.0)	11	46.9 ± 29.9	6	39.8 ± 28.1	18	24.5 ± 28.6
Left Outside Lips Corner	20	42 (12.0)	19	42.5 ± 29	22	31.9 ± 26.1	6	35.2 ± 32.0
Right Thumb MP Joint (Palmer)	21	41 (11.7)	7	49.5 ± 34.6	4	42.0 ± 30.6	5	35.5 ± 31.4
Right Outside Lips Corner	22	41 (11.7)	18	42.9 ± 29.8	23	31.7 ± 26.0	4	36.3 ± 31.6
Right Lower Back	23	38 (10.9)	16	43.9 ± 27.3	14	37.0 ± 25.4	20	24.0 ± 27.8
Lower Left Central Incisor	24	38 (10.9)	26	37.6 ± 28.9	26	29.2 ± 23.9	15	27.8 ± 28.9
Left Lower Back	25	37 (10.6)	14	45.3 ± 29	13	37.4 ± 26.9	26	20.9 ± 25.4
Right Neck Front	26	36 (10.3)	24	39.5 ± 34	18	33.6 ± 27.7	27	16.7 ± 25.9
Right Thumb IP Joint (Palmer)	27	35 (10.0)	1	56.8 ± 33.4	5	41.8 ± 31.8	7	35.0 ± 35.2

Table 3A: Musculoskeletal Pain Sites by Prevalence

Musculoskeletal Site	Prevalence Rank	Prevalence n (%)	Frequency Rank	Frequency Mean ± SD	Intensity Rank	Intensity Mean ± SD	Influence Rank	Influence Mean ± SD
Inside Bottom Lip	1	120 (34.3)	4	53.40 ± 28.6	1	46.8 ± 27.6	1	45.0 ± 33.5
Right Thumb Median Nerve (Palmer)	11	66 (18.9)	3	54.6 ±28.6	2	46.3 ± 27.1	2	41.8 ± 32.2
Right Thumb Radial Nerve (Dorsal)	4	81 (23.1)	2	55.6 ± 29.8	3	44.1 ± 26.8	3	39.2 ± 34.4
Right Outside Lips Corner	22	41 (11.7)	18	42.9 ± 29.8	23	31.7 ± 26.0	4	36.3 ± 31.6
Right Thumb MP Joint (Palmer)	21	41 (11.7)	7	49.5 ± 34.6	4	42.0 ± 30.6	5	35.5 ± 31.4
Left Outside Lips Corner	20	42 (12.0)	19	42.5 ± 29	22	31.9 ± 26.1	6	35.2 ± 32.0
Right Thumb IP Joint (Palmer)	27	35 (10.0)	1	56.8 ± 33.4	5	41.8 ± 31.8	7	35.0 ± 35.2
Right Thumb CMC Joint (Dorsal)	15	51 (14.6)	17	43.1 ± 27.5	16	34.1 ± 24.7	8	33.5 ± 27.6
Right Thenar	8	73 (20.9)	5	50.7 ± 34	11	38.5 ± 28.9	9	31.3 ± 28.7
Right Thumb IP Joint (Dorsal)	3	92 (26.3)	13	45.5 ± 29	15	35.0 ± 25.3	10	30.0 ± 30.1
Center Cutaneous Lower Lip	17	48 (13.7)	20	42.4 ± 28.5	20	32.4 ± 23.1	11	29.9 ± 27.0
Right Thumb MP Joint (Dorsal)	2	98 (28.0)	22	42.06 ± 28.2	17	33.7 ± 24.7	12	29.6 ± 27.9
Center Bottom Lip (Vermilion)	12	62 (17.7)	15	44.7 ± 28.3	27	27.8 ± 23.5	13	29.5 ± 26.3
Right Wrist Front	9	66 (18.9)	21	42.2 ±30.4	19	33.2 ± 26.4	14	28.7 ± 27.8
Lower Left Central Incisor	24	38 (10.9)	26	37.6 ± 28.9	26	29.2 ± 23.9	15	27.8 ± 28.9
Right Forearm Front	6	79 (22.6)	23	39.9 ± 27.5	24	30.8 ± 25.3	16	26.7 ± 27.2
Right Wrist Back	16	49 (14.0)	25	39.1 ± 29.7	21	31.9 ± 28.5	17	26.6 ± 30.1
Left Shoulder Back	19	42 (12.0)	11	46.9 ± 29.9	6	39.8 ± 28.1	18	24.5 ± 28.6
Left Neck Back	7	74 (21.1)	10	47 ± 28	10	38.9 ± 26.3	19	24.0 ± 28.5
Right Lower Back	23	38 (10.9)	16	43.9 ± 27.3	14	37.0 ± 25.4	20	24.0 ± 27.8
Right Forearm Back	14	53 (15.1)	27	33.2 ± 24.7	25	30.3 ± 21.8	21	23.9 ± 26.0
Right Neck Back	5	80 (22.9)	9	47.1 ± 28.6	9	39.1 ± 25.1	22	23.7 ± 28.5
Right Shoulder Back	18	47 (13.4)	8	48.5 ± 30.4	8	39.3 ± 27.1	23	23.5 ± 27.3
Left Upper Back	13	61 (17.4)	12	46 ± 27.5	12	37.8 ± 24.8	24	22.7 ± 26.8
Right Upper Back	10	66 (18.9)	6	50.1 ±26.5	7	39.7 ± 22.1	25	21.8 ± 24.3
Left Lower Back	25	37 (10.6)	14	45.3 ± 29	13	37.4 ± 26.9	26	20.9 ± 25.4
Right Neck Front	26	36 (10.3)	24	39.5 ± 34	18	33.6 ± 27.7	27	16.7 ± 25.9

Table 3B: Musculoskeletal Pain Sites by Influence

The inclusion of advanced and more detailed body maps revealed that the inside of the bottom lip was the most prevalent pain site selected by 33.75% of respondents. These results supplement the findings presented by Thrasher and Chesky thanks to new advancements in survey techniques. In addition, the right thumb metacarpophalangeal (MP) joint (dorsal) (28.0%), right thumb interphalangeal (IP) joint (dorsal) (26.3%), right thumb radial nerve (dorsal (23.1 %), right neck back (22.9%) were among the top five most prevalent pain sites among surveyed clarinetists. When ranking the top 27 pain sites by prevalence (Table 3A) lip and mouth regions, right wrist, and thumb regions are mixed throughout. However, ranking the same sites by influence places all of these sites at the top of the list (Table 3B). While the inside of the lower lip remains both the most prevalent and influential, it is important to emphasize that the right wrist and thumb along with additional sites in the lip and mouth regions have great influence on learning and performing the clarinet.

When considering the prevalence of the most influential pain sites across male and females, many were statistically insignificant. However, the right thumb median nerve (palmer) had statistically significant differences between male (11.5 %) and female (23.3%) survey participants.

As shown in Figure 4, the words most frequently selected to describe the results from these questions revealed that tender (17.5%), sharp (14.2%), and aching (8.3%) were among the most common terms used to describe pain associated with the inside of the lower lip. The top 8 words most prevalently used to describe this pain site are displayed in Figure 4 using a word map that places more emphasis on the words most selected by participants.

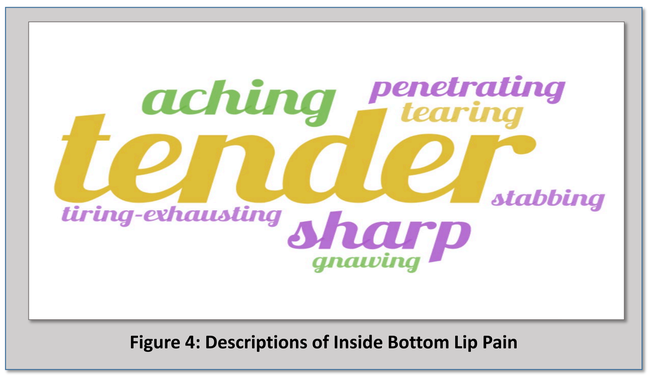

Figure 4: Descriptions of Inside Bottom Lip Pain

In an attempt to help manage musculoskeletal pain, clarinetists may utilize assistive aids such as neck straps and tooth guards. As indicated on Figure 5, all of the respondents (users and non-users) were asked to rate how much using a tooth guard and neck strap helped to manage pain on a VAS Scale from 0 (not at all) to 100 (completely helps). Results regarding the effectiveness of using a tooth guard for pain management revealed that females clarinetists reported a mean of 30.4 and males reported a mean of 33.5. When the respondents were asked to rate how much using a neck strap helped to manage their pain on the same VAS scale mentioned above both non-users and users reported a mean level of effectiveness at 41.5 (female) and 29.5 (male).

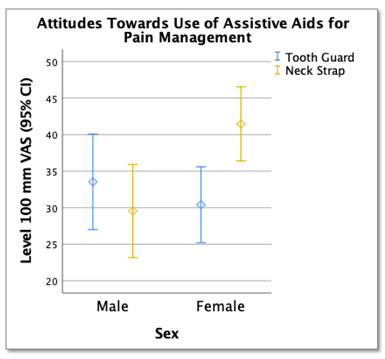

Figure 5: Attitudes Towards Assistive Aids Across Sex

In order to manage pain inside the lower lip, 39.3% of female clarinetists report regularly using a tooth guard while playing the clarinet and similarly, 38.9% of male clarinetists report using this device. Use of tooth guards among male and female clarinetists is not statistically significant (X^2=.004, p=.950). However,

Both male and female clarinetists that use tooth guards to manage pain rate their level of effectiveness much higher.

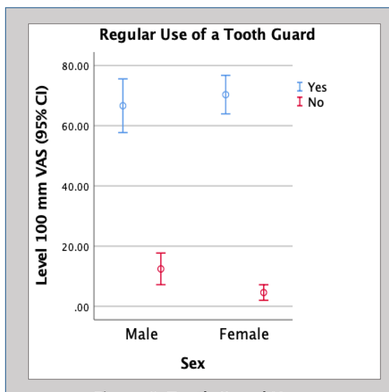

Figure 6: Tooth Guard Users

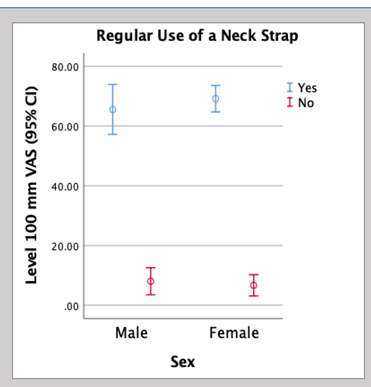

Figure 7: Neck Strap Users

Results from this study also revealed that a statistically significant (X^2=10.99, p=.001) number of female clarinetists (55.7%) use neck straps while playing the clarinet while only 37.4% of males use a neck strap. However, Again, among those clarinetists who regularly use a neck strap for pain management, there is a much larger level of agreement about the effectiveness of this product.

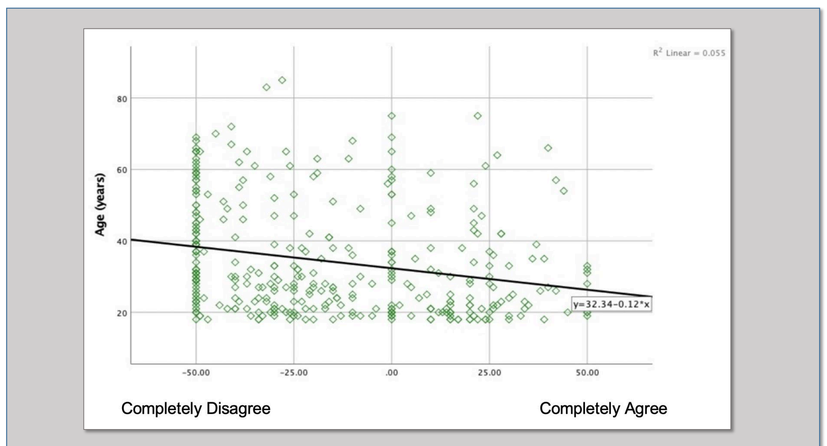

Figure 7: Level of Agreement: No Pain, No Gain by Age

The "No Pain, No Gain" attitude that is present in athletics is also present in some aspects of music making and learning. In order to more clearly define how the clarinet community might approach such a sentiment, clarinetists were asked to indicate their level of agreement, on a sliding VAS scale from -50 (strongly disagree) to 50 (strongly agree); male clarinetists had a mean level of disagreement at -16.06 ± 28.79 and females had a level of disagreement at -15.05 ± 30.20. However, the variation among responses as indicated by the standard deviation was extremely broad. While the majority of clarinetists disagree with the "No Pain, No Gain" attitude, PAH professionals and other stakeholders including, educators should note that there are young clarinetists who agree with this sentiment.

Conclusion

Despite what seems like a declining belief in "No Pain, No Gain" among clarinetists, **89.7%** of surveyed musicians report a musculoskeletal problem associated with playing the clarinet. The most prevalent pain sites indicated in this survey were the inside of the lower lip and right wrist. As principal areas of concern, these should be highlighted in health education efforts, especially those designed for students learning and performing the clarinet. Due to the high prevalence of pain among clarinetists, music makers and learners may seek out assistive aids for pain management while playing the clarinet. Attitudes towards these devices are generally more positive among women and clarinetists who regularly use them for pain management. This research should open the conversation among PAH professionals and other stakeholders about ways to best approach learning and performing the clarinet in order to reduce pain. Additional conversations must occur about the attitudes the clarinet community has about the use of assistive aids in clarinet playing. Finally, further research is necessary to address the inside of the lower lip and the effectiveness of assistive aids.

This study represents the second known and largest epidemiologic study exclusively for clarinetists. Prior limited research and novel survey techniques warranted updated research for this population. This study introduced new survey protocols that allowed for detailed assessment of site-specific and diffuse pain specifically in the hands and lips. Results from this study provide a more precise understanding of musculoskeletal pain and non-musculoskeletal health problems associated with playing the clarinet. The findings from this study will help inform both health care providers seeking to work with this population and clarinetists who perform and or teach.

Of the 55 known epidemiologic studies to contain clarinetists, only 19 specifically named clarinet-specific injuries. This study affirms that clarinetists needs and injuries are not fully compatible with other instruments in the woodwind family. Therefore, future research needs to address the clarinet-specific injuries without generalizations.

References:

1. Thrasher M, Chesky K. Medical problems of Clarinetists: Results from the UNT Musician Health Survey. The Clarinet 1998 25(4):24-27.
2. Thomas CJ. "Describing and measuring the athletic identity construct: Scale development and validation," PhD diss., The Ohio State University (2004): 46.
3. Thomas CJ. "Describing and measuring the athletic identity construct: Scale development and validation," PhD diss., The Ohio State University (2004): 46. Chesky KS, Kondraske G, Rubin B. Effect of elastic neck strap on right thumb force and force angle during clarinet performance Journal of Occupational Environmental Medicine 2000 42(8):775-776
4. Chesky KS, Kondraske G, Rubin B. The Texas Center for Music and Medicine explores the biomechanics of clarinet performance The Clarinet 2000 27(2):34-36.
5. Shoup D. "Survey of performance-related problems among high school and junior high school musicians." Medical Problems of Performing Artists 10 (1995): 100.
6. Wallace E, Klinge D, Chesky K. Musculoskeletal pain in trombonists: Results from the UNT trombone health survey. Medical problems of performing artists. 2016 Jun 1;31(2):87-95.

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Kensley Behel is a classically trained clarinetist from the southeastern United States. Two years following her solo debut with the Jacksonville Symphony Orchestra, she underwent surgery to correct Velopharyngeal Insufficiency. Her own journey with musculoskeletal injuries drives her passion to find solutions for others. A current Ph.D. student in Performing Arts Health, she co-authored a publication on musicians' health with the National Institute of Health and National Network of Libraries of Medicine South Central Region to help promote literacy among the performing artist population.

Meghan S. Taylor

As a musician-researcher at the Texas Center for Performing Arts Health (TCPAH), Meghan has expanded her research areas of interest and expertise to include music performance anxiety, epidemiology, vocal health, hearing conservation, health promotion in schools of music, and National Network of Libraries of Medicine (NNLM) Resources. Most recently, Meghan worked with the representatives from the TCPAH to publish a booklet and give corresponding presentations about Musicians Health 2019 Texas Music Educators Association Convention at an exhibit hall booth sponsored and funded by the NNLM - South Central Region.