

String Players with Hyperhidrosis: An Investigation of Performance Problems due to Excessive Sweating

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Introduction

Hyperhidrosis is a medical condition characterized as extreme and excessive sweating causing unnecessary amounts of perspiration to regulate one's body temperature. According to the International Hyperhidrosis Society, almost 5% (365 million) people suffer from hyperhidrosis (1). Other estimates range from 2.8% in the USA, to 12.8% in Japan, to 16% in Germany (2). With symptoms of excessive sweating, most people with hyperhidrosis experience significant physical, psychological, and social discomforts in their daily life - especially for those who mainly use and work with their hands.

In addition to the potential to damage musical instruments (3), excessive sweating can influence biological factors necessary for perceptual acuity (4) as well as performance techniques essential for playing musical instruments. Moisture is known to modify abilities to perceive vibration, which can decrease essential perceptual resources for playing string instruments (5). Moisture from sweating can also alter friction levels between the fingertips and instrument making it harder to control and manipulate finger placement and mobility (4). Such alterations can lead to increases in biomechanical pinch and grip forces on both hands. Increases in these forces can lower precision, speed, and fluidity of motion. Anecdotal evidence suggests that these types of physical and technical challenges can be extremely stressful for string players (6). In addition to these biological and biomechanical consequences of sweat, excessive sweating is often visible to peers and audiences and therefore also likely to create embarrassing social situations (7). Musicians with hyperhidrosis may purposely limit or avoid high stress situations including those associated with evaluations, competitions, and solo performances which could impact success, career choice, and/or overall satisfaction with playing music. Clearly, this cluster of interconnected factors should be examined through the biopsychosocial model of health (8).

To date, research on problems associated with hyperhidrosis among musician groups is limited. To address this deficiency, a pilot survey was conducted in 2017-18 and confirmed that some student string musicians (N=20) majoring in performance at a large school of music met the criteria for hyperhidrosis even though some have never heard of this genetic condition. The results also indicated that excessive sweating creates technical and musical challenges due to excessive moisture on the hands when performing. Follow-up interviews with these students strongly suggested the need for additional research.

In order to better understand the experience of having hyperhidrosis, the purpose of this study was to apply a biopsychosocial framework to investigate how string players are impacted by hyperhidrosis.

Specific aims include:

1. Examine the frequency of impact that hyperhidrosis has on non-musical life events.
2. Investigate and compare the frequency, intensity, and negative influence of excessive sweating in various music-specific contexts.
3. Assess the overall impact that excessive sweating has on the ability to play a string instrument.
4. Assess the level of influence that excessive sweating has on technical, musical, and psychological abilities to perform music.
5. Estimate the relationships between levels of influence across performance abilities on the overall impact of hyperhidrosis on the ability to perform music.
6. Investigate the reciprocal relationship between excessive sweating and performance anxiety.
7. Assess aspirations to try treatment options and perceived levels of importance of hyperhidrosis to musicians.

Method

An online survey was developed, IRB approved, and deployed using Qualtrics Software. Subjects were recruited using a purposive sampling methodology. Recruitment protocol encouraged subjects to participate according to the needs of the study. In addition to the purposive recruiting methodology, the Dermatology Advisor Checklist of Symptoms for Self-identification of Hyperhidrosis was built into the survey and used to screen for participants that met inclusion criteria. In addition to a brief demographics section, the survey deployed a series of 100 mm VAS scales to assess 1) frequency of non-musical consequences related to excessive sweating, 2) frequency, intensity, and negative influence of sweating across typical musical contexts, 3) levels of influence on a) psychosocial, b) technical, and c) musical dimensions of performing, and 4) the overall impact of excessive sweating on ability to perform. Data were exported into SPSS and processed according to the aims of the study.

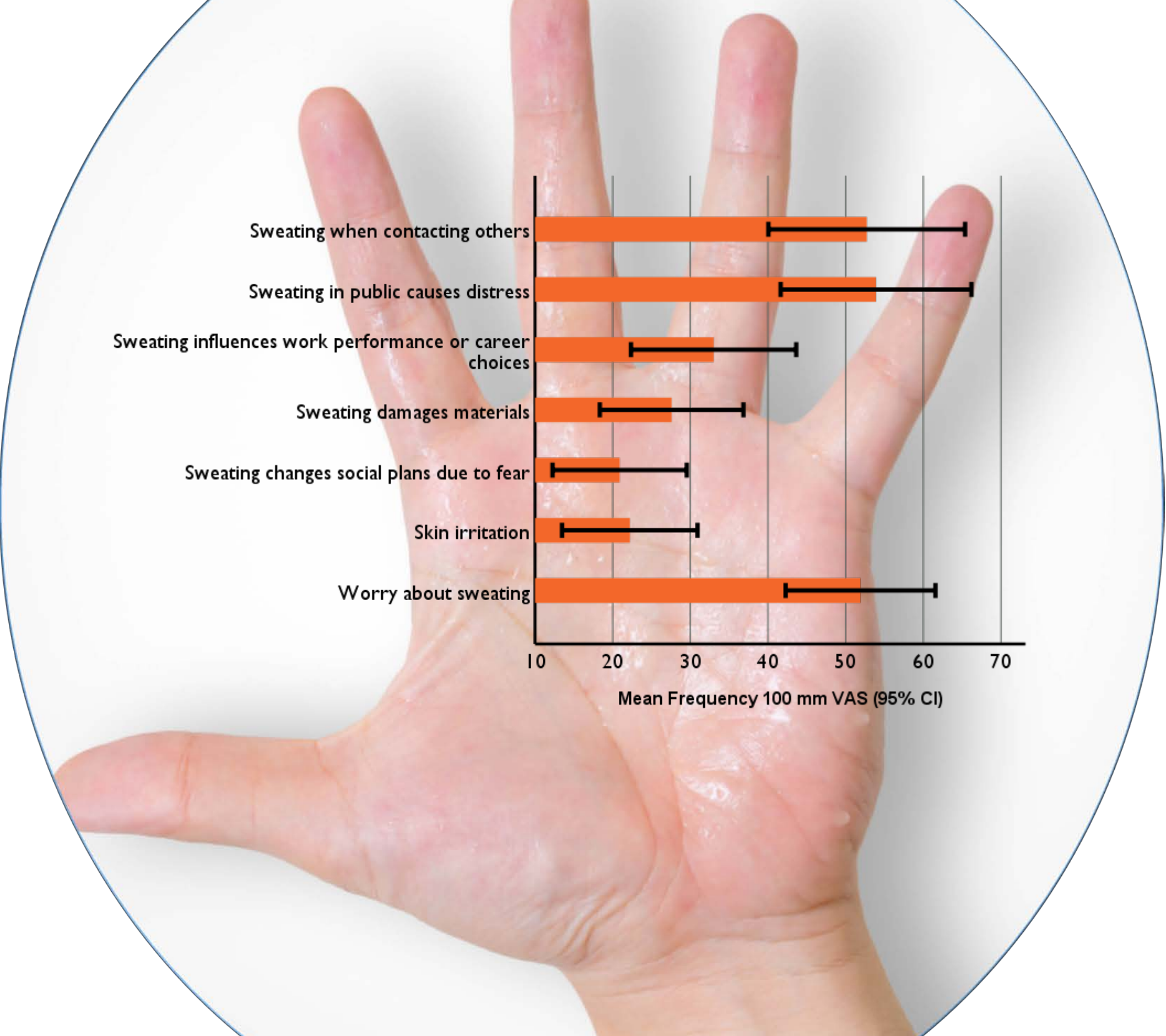
Results

Of the 62 string musicians that responded, 11 were removed because they did not meet the Dermatology Advisor checklist of symptoms for self-identification of hyperhidrosis. The resulting cohort (N=51) included 23 females, an average age of 34.74 yrs. About half reported Viola as their primary instrument (n=27), followed by Violin (n=15), Cello (n=7), Harp (n=3), Guitar (n=2), and one Ukulele.

Frequency of impact that hyperhidrosis on non-musical life events

As shown in Figure 1, subjects reported frequency of non-music related problems associated with excessive sweating. Problems include social (change social plans, public distress, sweating when contacting), psychological (worry), occupational (impact on work or career choice), physical/external (damage), and biological (skin irritation). The highest frequencies of problems suggest psychosocial vulnerabilities associated with excessive sweating. However, subjects reported relatively low levels of changing social plans due to excessive sweating.

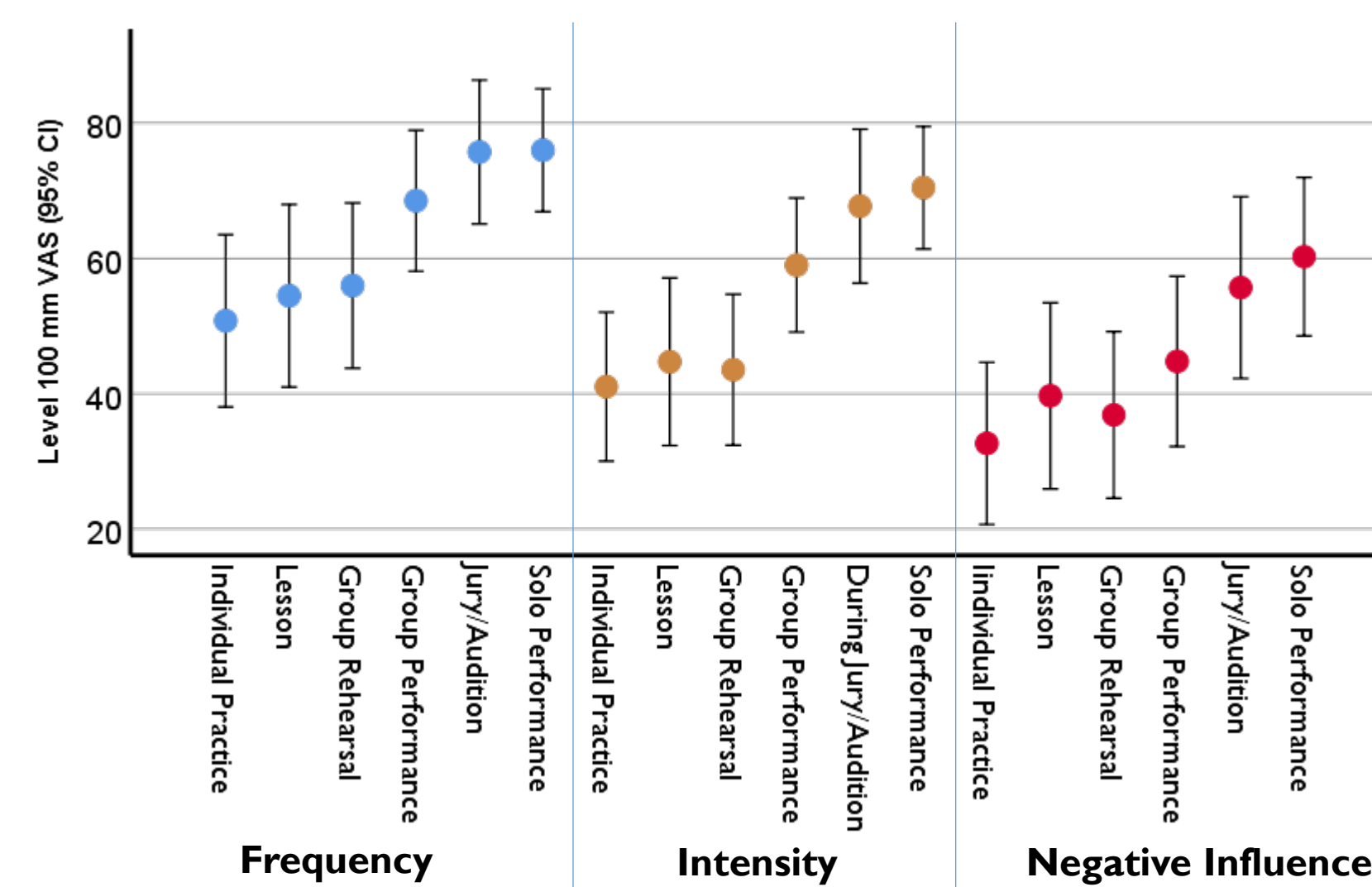
Figure 1: Frequency of Problems due to Hyperhidrosis in Non-musical Contexts



Frequency, intensity, and negative influence of excessive sweating in various music-specific contexts

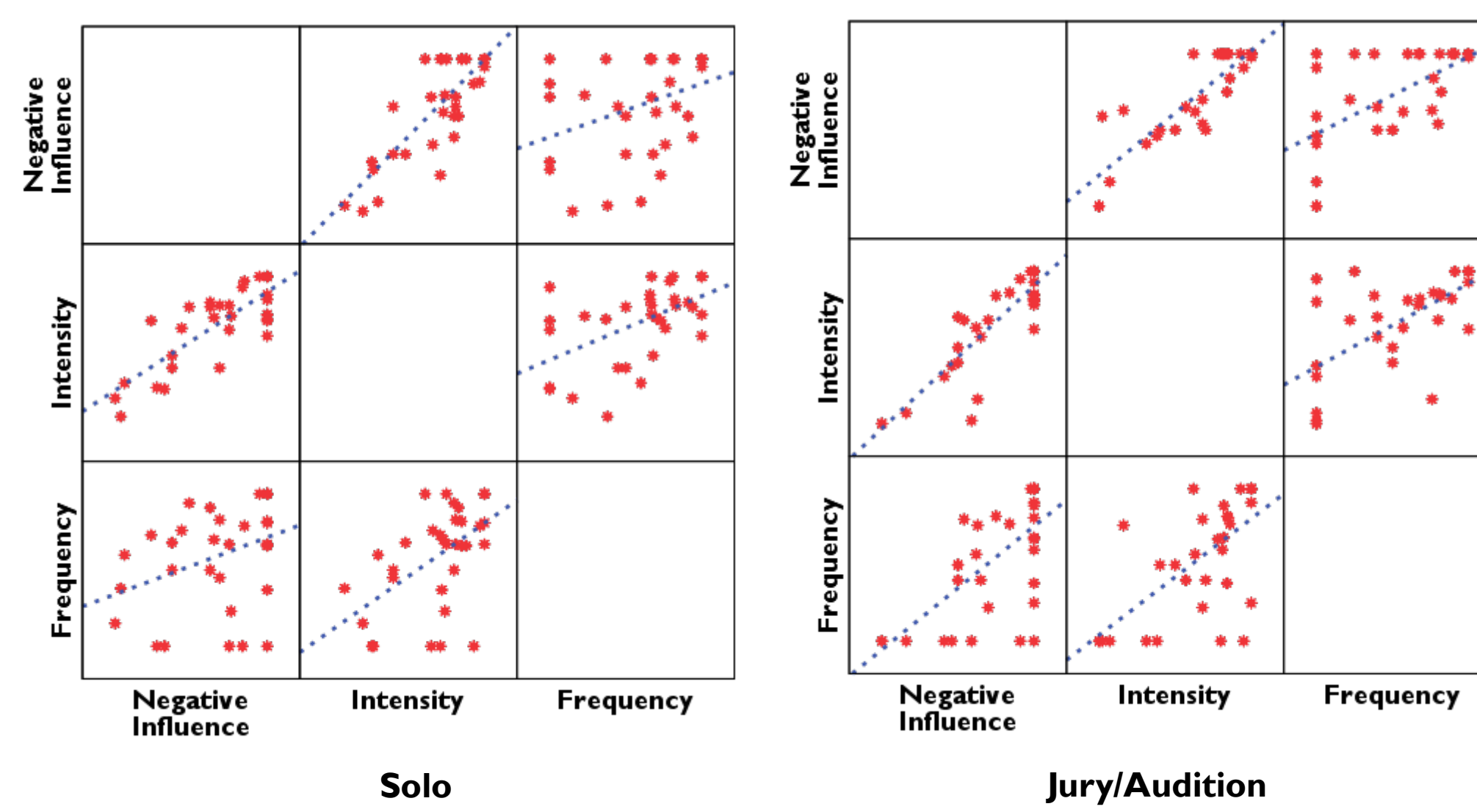
The mean frequency levels of impact of hyperhidrosis in various musical contexts are shown in Figure 2. Clearly, the average frequency, intensity, and impact are related to the music-specific conditions and are lowest for individual practice sessions and highest for jury/auditions and solo situations.

Figure 2: Comparison of Frequency, Intensity, and Negative Influence of Excessive Sweating in Different Musical Contexts



The scatter plots and trend lines in Figures 3 and 4 show the relationships between frequency, intensity, and negative influence for both the Solo and Jury/Audition performance situations. Bivariate correlations in the Solo condition are significant between frequency and intensity ($r = .810, p < 0.000$), frequency and influence ($r = .362, p = 0.035$), and intensity and influence ($r = .542, p = 0.001$). Similar relationships were found for Jury/Audition between frequency and intensity ($r = .876, p < 0.000$), frequency and influence ($r = .641, p < 0.000$), and intensity and influence ($r = .647, p < 0.000$).

Figure 3 and 4: Scatterplots and Trend Lines showing relationships between Frequency, Intensity, and Negative Influence of Sweating during Solo Performance and Jury/Auditions.



Overall impact of excessive sweating on the ability to play a string instrument.

Figures 5a and 5b show that the overall impact of sweating on the ability to perform string instrument. The average impact was 48 (SD=31) and the data ranged from the minimum of 0 to the maximum of 100, which indicates that the overall impact of sweating varies widely. Figure 5b demonstrates that excessive sweating can cause musicians to change their technique.

Figure 5a: Overall Impact of Excessive Sweating on Ability to Play String Instrument

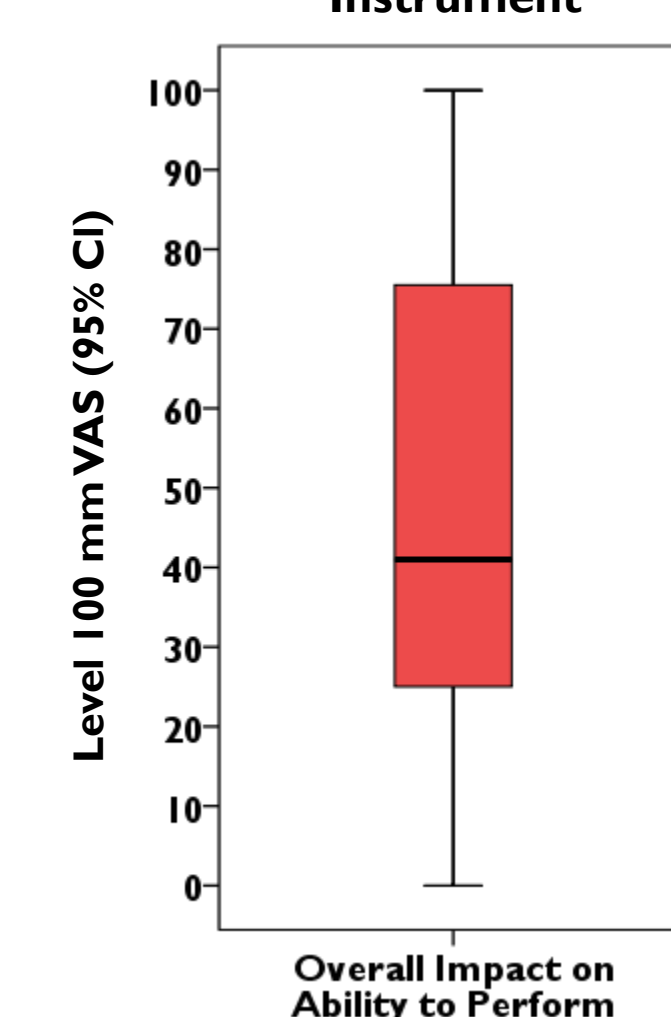
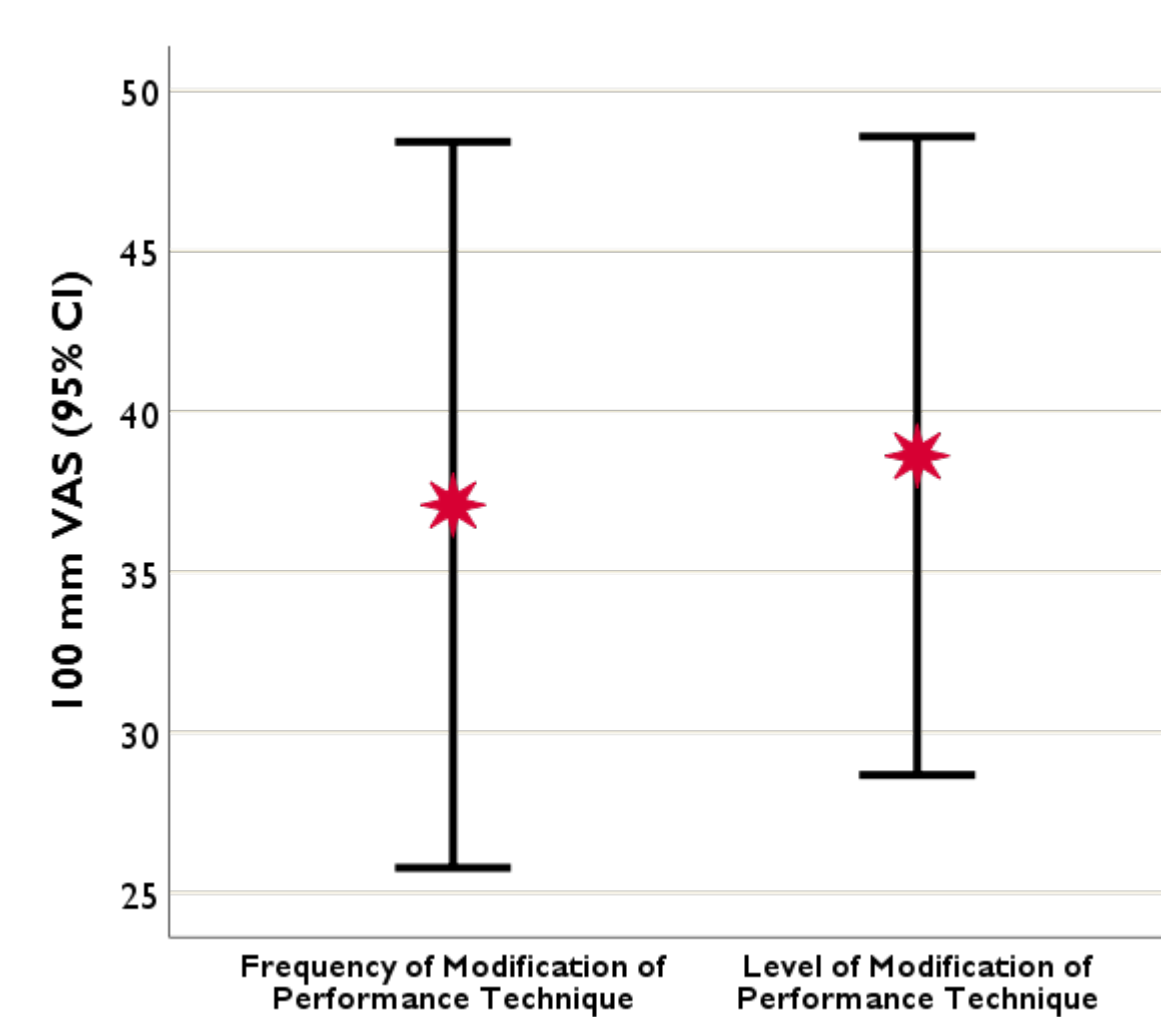


Figure 5b: Modification of Performance Technique due to Excessive Sweating



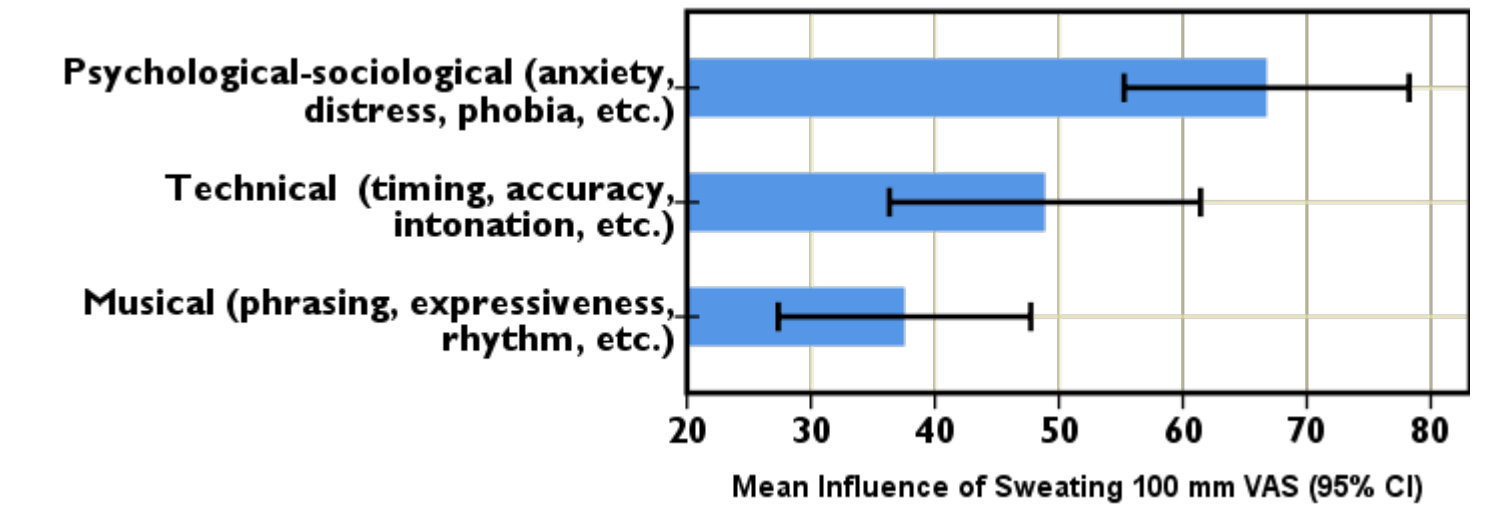
As a native of South Korea, Daemin Kim started his musical education at the age of 9 on the violin and began playing the viola at the age of 16. In Korea, he studied at Anyang Arts High School and Dankook University. In 2010, he transferred to Arizona State University, where he graduated in 2014 with a Bachelor of Music in viola performance. In 2016, he received his master's degree at Boise State University. Kim served as principal viola of the ASU Symphony Orchestra and BSU Symphony Orchestra, and he performed as a member of graduate quartet in residence program at Boise State and a section member of Boise Philharmonic Orchestra. During the summer of 2018, he served as a principle violist for the Rubace Philharmonic in South Korea. Currently, he is a DMA student in viola performance studying with Dr. Susan Dubois at University of North Texas and the related field in Performing Arts Health with Dr. Kris Chesky.



Influence of excessive sweating on psychosocial, technical, and musical abilities related to playing a string instrument

The perceived influences of excessive sweating when playing a string instrument on psychosocial, technical, and musical abilities are shown in Figure 6. Psychosocial abilities were reported to be most influenced by sweating.

Figure 6: Specific Influence of Excessive Sweating on Psychosocial, Technical, and Musical Abilities in Playing Music



Relationships between levels of influence across performance abilities on the overall impact of hyperhidrosis on the ability to perform music

The results of a linear regression analysis, used to determine the relationships between overall impact of excessive sweating on playing a string instrument and the three areas of specific influence (psychosocial, technical, and musical) shows that these variables account for a statistically significant proportion of the variance in impact on playing ($F=9.277, p=0.000$). The model summary shown in Table 1 illustrated a statistically significant and medium (44% variance accounted for) contribution to the prediction of impact on playing. Statistically significant coefficients were found for influences on Technical ($B=.437, p=0.005$) and Musical abilities ($B=.349, p=0.036$) but not for Psychosocial influences ($B=.109, p=0.109$).

Table 1. Linear Regression Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.700 ^a	.490	.437	22.1505	.490	9.277	3	29	.000

Hyperhidrosis and performance anxiety

Figures 7a and 7b show levels of perceived influence of sweating on performance anxiety, influence of performance anxiety on sweating, and the reciprocal relationship between these two factors. While subjects reported higher levels of performance anxiety influencing sweating, the level is not significantly higher compared to perceived levels of sweating causing anxiety ($t = -1.932, p = .062$). Additional analysis indicates a statistically significant bivariate correlation between the influence of sweating on performance anxiety and the influence of performance anxiety on sweating ($r = .705, p < 0.000$).

Figure 7a: Level of Influence of Excessive Sweating and Performance Anxiety on each other

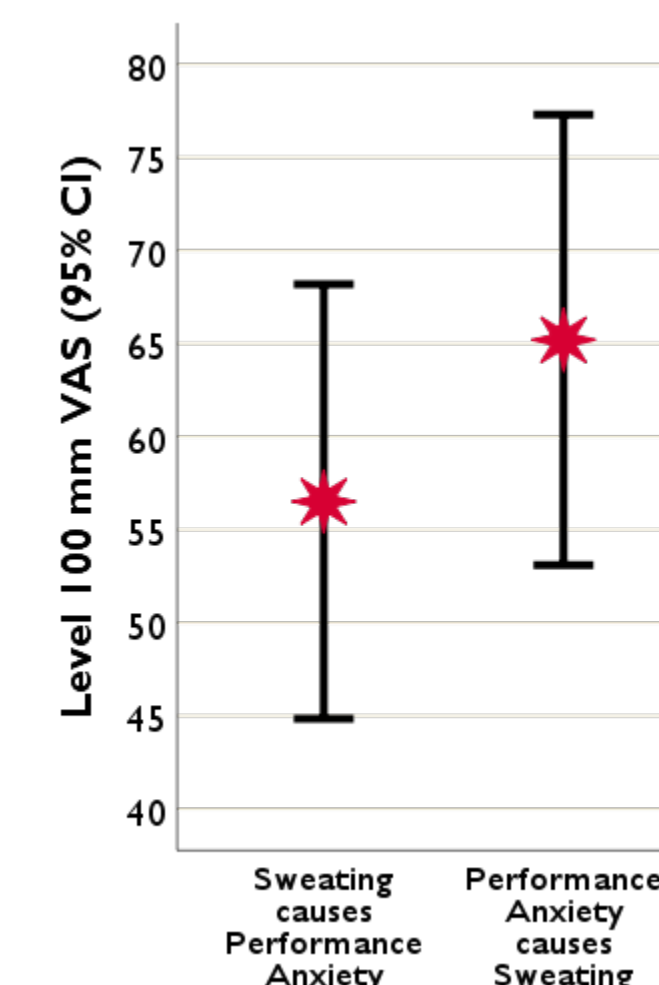
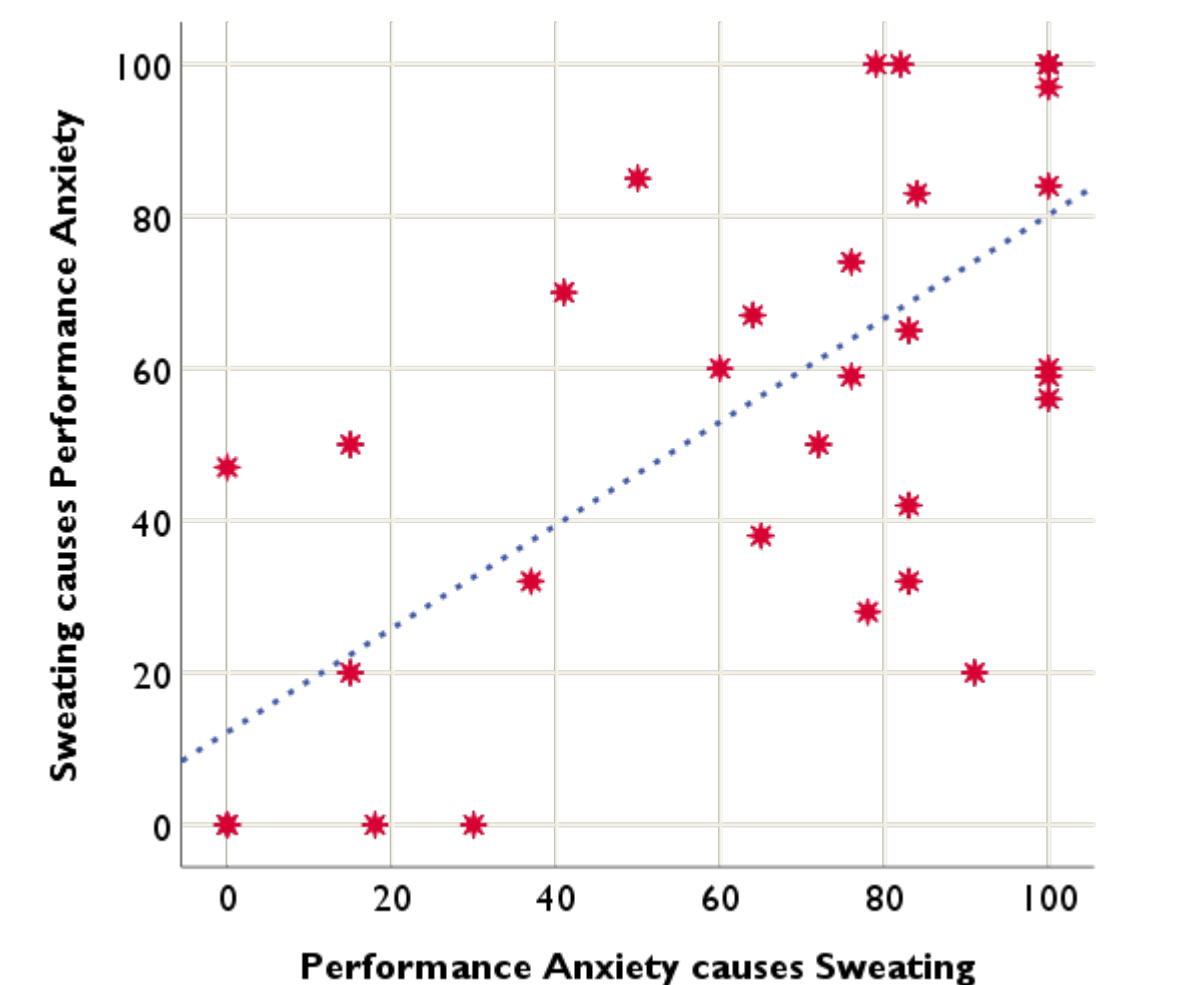


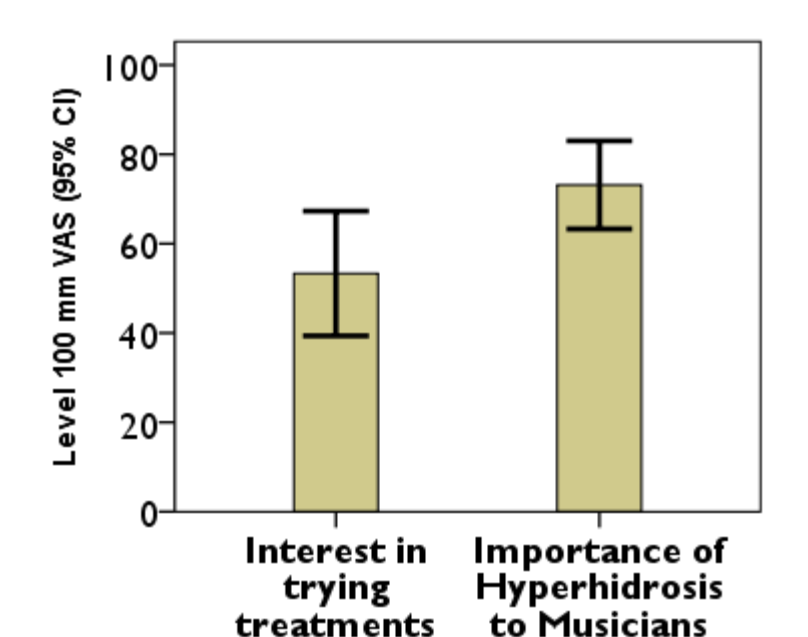
Figure 7b: Scatterplot and Trend Line



Interest in trying treatment options and level of importance of hyperhidrosis to musicians

The bar graph in Figure 8 shows the level of interest in trying treatments for hyperhidrosis and the importance of hyperhidrosis to musicians. Since over 50% of subjects were interested in trying treatments and since a large majority of subjects find hyperhidrosis to be important, the effect of hyperhidrosis on musicians is a topic that requires more research.

Figure 8: Interest in Trying Treatments and Importance of Hyperhidrosis



Conclusion

In conclusion, the results of this study suggest that hyperhidrosis has a negative impact on the ability to play a string instrument, and the effects increase as the exposure and importance of the context increase. Excessive sweating can affect psychosocial abilities in playing music as well as create psychosocial problems in non-musical contexts. Musical and Technical abilities are significant predictors of the overall impact of sweating, although the overall impact varied widely among the subjects. However, there are limitations to this study. The data were collected using subjective scales, so objective measures could be used in the future to collect empirical data. In addition, the sample population was small and did not diagnose subjects with hyperhidrosis, so the sample population could be increased in size and restricted to people diagnosed with hyperhidrosis. More research on hyperhidrosis and musicians is necessary to address the issues that musicians who sweat excessively face.

References

1. International Hyperhidrosis Society [webpage]. Defining Hyperhidrosis. Available from: <https://www.sweathelp.org/home/defining-hyperhidrosis.html>. [cited 2019 Jun 17]
2. Liu Y, Bahar R, Kalia S, Huang RY, Phillips A, et al. Hyperhidrosis Prevalence and Demographical Characteristics in Dermatology Outpatients in Shanghai and Vancouver. *PLoS One* 2016;11(4). <https://doi.org/10.1371/journal.pone.0153719>.
3. Benohian A. Primary focal hyperhidrosis (Hyperhidrosis). *Dermatology Advisor*. Available from: <https://www.dermatologyadvisor.com/home/decision-support-in-medicine/dermatology/primary-focal-hyperhidrosis-hyperhidrosis/>.
4. Abdouni A, Djaghoul M, Theulin R, Paillet-Mattet C, Zahouani H. Biophysical properties of the human finger for touch comprehension: influences of ageing and gender. *Royal Society Open science*. 2017;4(170321). <http://dx.doi.org/10.1098/rsos.170321>
5. Wollman I, Fritz C, Frelat J. On the Characterization of Vibrotactile Feedback in Violinists' Left Hand: A Case Study. *Acta Acustica united with Acustica*. 2015;101(3):360-368. <https://www.ingentaconnect.com/content/daw/asa/2015/00000101/00000002/art00016>
6. Derler S, Süss J, Rao A, Rotaru G-M. Influence of variations in the pressure distribution on the friction of the finger pad. *Tribology International*. 2013;63(7):14-20. <https://doi.org/10.1016/j.triboint.2012.03.001>.
7. Franklin R, Richard G, Heimberg, Michael R, Carlos B, Lyall A. Social anxiety and functional impairment in patients seeking surgical evaluation for hyperhidrosis. *Comprehensive Psychiatry*. 2012;53(8): 1181-1186. <https://doi.org/10.1016/j.comppsy.2012.04.009>.
8. McLaren N.A. A Critical Review of the Biopsychosocial Model. *Australian & New Zealand Journal of Psychiatry*. 1988;32(1), 86-92. <https://doi.org/10.3109/00048679809062712>.

