



Exploration of the Current State of Diagnostic Electromyography Education in Doctor of Physical Therapy Programs Throughout the United States: A Survey Study

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Abstract

Study Rationale: Electromyography (EMG) is an essential diagnostic and intervention tool for patients and is within the physical therapy scope of practice. Based on our research, we found a lack of literature regarding information on EMG education for Doctor of Physical Therapy (DPT) students across the United States. EMG education literature is concentrated in different medical specialties, such as neurology, physical medicine & rehab and physical therapy. But it remains relatively sparse when compared to other fields within medical education. This might be due to limited educational research in EMG, training duration and requirements, and technological advances and complexity. Therefore, further evaluation is necessary to acquire a more nuanced understanding of the current state of diagnostic EMG education in DPT programs. This research can shed light on and establish a baseline of needed information for EMG study within DPT programs.

Purposes of the Study: The purpose of this study was to evaluate DPT faculty perceptions of diagnostic EMG education and explore the current EMG curricula in Commission on Accreditation in Physical Therapy Education (CAPTE) accredited DPT programs across the United States (U.S.).

The second purpose of this study was to explore the current EMG curriculum in CAPTE- accredited DPT programs within the United States.

Research Hypothesis: Based on the lack of literature, we hypothesize that DPT instructors in the United States will report at least 20% of electromyography programs within DPT curriculums are underutilizing diagnostic clinical applications for those that do include EMG training.

Null hypothesis: DPT instructors in the United States will report no significant difference amongst electromyography programs within DPT curriculums regarding underutilizing diagnostic clinical applications for those that do include EMG training.

Introducing Electromyography (EMG)

Electromyography (EMG) is a tool used for analyzing electrical activity initiated by innervating nerves that activate special cells within skeletal muscles [1]. The EMG sensors detect the muscle's electrical potentials and measure the signals in a quantifiable data set [1]. Any abnormal signs on the EMG report that result from a loss in motor axons could impart an underlying pathology [2]. This illustrates the value of diagnostic EMG with regards to identifying pathology in a clinical context [2]. The purpose of these nerve conduction studies is to detect the electrical potential generated by muscles when a contraction is initiated [3]. The benefit of such studies is the ability to detect neuromuscular disorders, such as amyotrophic lateral sclerosis (ALS), Carpal tunnel syndrome (CTS), radiculopathy, sciatica, and muscular dystrophy which can aid in diagnosis and prognosis [4]. It should be noted that such diagnostic studies have been shown to be safe and effective amongst most patients [5]. In addition, EMG studies are useful as they are the gold standard in the diagnosis of peripheral nerve disorders [4]. These studies show that diagnostic EMG can be substantial for physical therapy. This could yield better outcomes in patient satisfaction and clinical decision making for the physical therapy practice [6].

Clinical decision making and EMG current practices in DPT

In order to incorporate EMG in their clinical practice, physical therapists need to undergo extensive training with specific requirements in patient hours, mentored studies, and case studies in order to sit for the EMG/Neurologic Clinical Specialist board certification examination [6]. Electro diagnostic testing used in physical therapy may reveal findings about a patient's diagnosis that can lead to more accurate and more effective interventions that could have been missed without the use of EMG [6]. Diagnostic EMG is also beneficial in the clinic to monitor patient progress and compliance with their intervention plan that allows the physical therapist to adapt the program to the specific patients' needs and goals [7]. The results of EMG diagnostic testing can have the potential to support more

accurate and individualized clinical decision making [6]. EMG has been used for years by various healthcare providers such as neurologists, physical therapists, and chiropractors [6]. There is limited research on diagnostic EMG use in outpatient physical therapy.

Current education and usage of EMG for medical students and Physical Therapists

Current diagnostic EMG education for medical field students is not as common as related to other diagnostic tools [9]. This is because of the complexity of the technique itself. It is difficult to teach electro diagnosis in a consistent and effective way [9]. When performing diagnostic EMG, it is more reliable and valid to use needle electrodes. Such devices are not common, and most people do not have the opportunity to learn from their hands-on use [10]. It is not realistic or affordable for this type of technology to be available to every student. Students with a better foundational knowledge have greater potential to form a deeper understanding of advanced topics such as diagnostic EMG [10]. In addition, using EMG for diagnostic purposes requires extensive knowledge of human physiology, biology, and physics [11]. Therefore, utilizing visual descriptions, analogies, and qualitative analysis will improve EMG data interpretation which will help physical therapists and kinesiologists to form an accurate diagnosis. With all of the above being presented, this is why the EMG implementation in the DPT programs curricula is important. Further evaluation of the current state of the content will help gain a better understanding of it.

Discussion

Interpretation of results: All respondents felt that students who graduated from their program are not unprepared to perform diagnostic EMG. No programs represented by the respondents taught EMG as an independent course. More than 80% of respondents felt that EMG content should be included in DPT program criteria. Some respondents were unaware of the status electromyography (EMG) has in their practice act. A State's Practice act is the law that determines the ability and legality of practicing clinicians to utilize EMG within their scope of practice [1]. Based on the data, if the Practice Act included EMG; the DPT programs in that state were more likely to have it within their curricula. Some were unaware of EMG's legal status in Practice Acts.

Programs in states where EMG was included in the practice act were more likely to teach it. Over 70% had diagnostic EMG in their curriculum, and just over 50% used needle electrodes.

Study limitations: Such as losing of internet connection, emails not sent to the respondent and Qualtrics software malfunction. There were a limited number of respondents, which makes our results less generalizable. The number of respondents also limited our statistical analysis. The study respondents did not represent every state within the US. Some respondents from the same state answered yes and some answered no if EMG is included in their state practice act. Rules and regulations regarding EMG practices for physical therapists vary by each state's practice act [12].

Implications of Practice: Limited hours of instruction and inadequate content may lessen DPT student's interest in pursuing diagnostic EMG as a specialization post-graduation. If there are not enough future clinicians interested in the field, DPT's are less likely to maintain the ability to perform this specialized skill in their practice acts/ scope of practice in general. DPT's in the US are already fighting for their right to keep diagnostic EMG within their scope of practice. Due to inadequate content, DPT students with an interest in diagnostic EMG are at a disadvantage. Because EMG content is not taught frequently or thoroughly enough, those who pursue diagnostic EMG will need to spend extra time outside of their DPT education to achieve a level of knowledge that is adequate. This returns to the point that there needs to be more DPT's pursuing diagnostic EMG to maintain the ability to perform it.

Suggestion for the structures of the survey: Shortening the survey may improve response rate. Consider framing questions based upon recurring themes from thematic analysis.

Suggestions for further studies and more expansion: Giving the survey to the DPT students to see their view on adequacy of EMG content (already in the works).

Survey Structure Suggestion: Shorten the survey to improve response rates and frame questions around recurring themes.

Further Study Suggestion: Survey DPT students on the adequacy of EMG content.

Conclusions

The results of our survey highlight significant gaps perceived by faculty regarding the adequacy of EMG content taught in DPT programs. Due to the limited number of respondents and the lack of representation from all states, generalizing the data across the U.S. was not possible. This limits the statistical analysis and the application of the study results. Furthermore, there were discrepancies in responses from participants residing in the same state if EMG was within their State Practice Act [12,13]. Several respondents reported that EMG was not featured in their state practice act, while other respondents from the same state mentioned that it was a part of their practice act. This discrepancy potentially influences the generalizability of the results as it can influence the respondent's perception of EMG content in their program. Additionally, survey data shows that participants felt that the current EMG content provided by their current DPT programs is insufficient for their students. These results, along with the thematic analysis suggest that EMG content should be taught more frequently with revised instructional methods and adjusted content to improve faculty perceptions of adequacy. Future research on this topic could benefit from a shortened survey and a survey given to current DPT students about their perspective on the adequacy of EMG content within their curriculum.

Further studies are encouraged to address perceived gaps in adequacy and refine EMG instructional approaches within Doctor of Physical Therapy programs across the nation.

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Conflicts of Interest: The authors declare that they have no competing interests.

References

1. Raez, M. B., Hussain, M. S., & Mohd-Yasin, F. (2006). Techniques of EMG signal analysis: detection, processing, classification and applications [published correction appears in *Biol Proced Online*. 8:163]. *Biol Proced Online*. 2006;8:11-35. doi:10.1251/bpo115
2. Sandoval, A. E. G. (2010) Electrodiagnostics for low back pain. *Phys Med Rehabil Clin N Am*. 21(4):767-776. doi:10.1016/j.pmr.2010.06.007.
3. Brambilla, C., Pirovano, I., Mira, R. M., Rizzo, G., Scano, A., & Mastropietro, A. (2021). Combined use of EMG and EEG techniques for neuromotor assessment in rehabilitative applications: A systematic review. *Sensors (Basel)*. 21(21):7014. doi:10.3390/s21217014.
4. Nagarajan, E., Bollu, P., Digala, L., Yelam, A., Govindarajan, R., & Brannagan, T. (2020). Safety of needle electromyography in critically ill patients. *RRNMF Neuromuscular Journal*;1(1): 31-35. doi:10.17161/rrnmf.v1i1.13544.
5. Sadikoglu, F., Kavalcioglu, C., & Dagman, B. (2017). Electromyogram (EMG) signal detection, classification of EMG signals and diagnosis of neuropathy muscle disease. *Procedia Comput Sci*. 120:422-429. doi:10.1016/j.procs.2017.11.259.

6. Rawat, M., Kostopoulos, D., & Rizopoulos, K., et al. (2020). Impact of electrodiagnostic (EMG/NCS) tests on clinical decision-making and patient perceived benefit in the outpatient physical therapy practice. *J Bodyw Mov Ther.* 24(1):170-174.
7. Kim, G., Kim, W. S., Kim, T. W., Lee, Y. S., Lee, H., & Paik, N. J. (2020). Home-based rehabilitation using smart wearable knee exercise device with electrical stimulation after anterior cruciate ligament reconstruction: A study protocol for a randomized controlled trial. *Medicine (Baltimore).* 99(20):e20256. doi:10.1097/MD.00000000000020256
8. Sonoo, M., Menkes, D. L., Bland, J. D. P., & Burke, D. (2018). Nerve conduction studies and EMG in carpal tunnel syndrome: Do they add value?. *Clin Neurophysiol Pract.* 3:78-88. Published 2018 Apr 5. doi:10.1016/j.cnp.2018.02.005
9. London, Z. N., Gallagher, G. W., & Ebright, M. J. (2017). A Self-Study Curriculum in Electromyography and Nerve Conduction Studies for Residents and Fellows. *MedEdPORTAL.* 13:10581. Published 2017 May 10. doi:10.15766/mep_2374-8265.10581
10. Suzuki, R., Muraoka, Y., & Okazaki, S. (2017). Development of a low-cost EMG biofeedback device kit as an educational tool for physical therapy students. *J Phys Ther Sci.* 29(9):1522-1526. doi:10.1589/jpts.29.1522
11. Gabriel, D. A. (2022). Teaching essential EMG theory to kinesiologists and physical therapists using analogies, visual descriptions, and qualitative analysis of biophysical concepts. *Sensors.* 22(17):6555.
12. Professions, occupations, and business operations (225 ILCS 90/) Illinois Physical Therapy Act. Illinois General Assembly. Accessed October 27, 2022. <https://www.ilga.gov/legislation/iles>
13. The Federation of State Boards of Physical Therapy. FSBPT. 2023. Accessed October 9, 2024. <https://www.fsbpt.org/Free-Resources/Licensing-Authorities-Contact-Information>.