

# Nutrition Among High School Female Athletes

DEFIANCE COLLEGE EXERCISE SCIENCE PROGRAM



Student Researcher: Riley Alcorn Faculty Mentor: Olivia Lozar, Ph.D.

## BACKGROUND

- High school presents various challenges for teenagers, including navigating academics, social dynamics, and extracurricular activities.
- During an eight-week period working closely with high school student athletes, a common issue among female athletes emerged: struggling with proper nutrition. First-hand experience with high school female athletes revealed nutritional deficiencies as a significant concern addressed by the athletic trainer.
- Many reported consuming one proper meal or less per day and inadequate hydration. This issue is worsened by the prevalence of eating disorders among young females aged 13 to 18, impacting their recovery from sports, menstrual cycles, and performance, collectively known as the Female Athlete Triad.

### Purpose

The purpose of this research is to educate young female athletes about the importance of proper nutrition to support their high-level performance and long-term health. Understanding the importance of providing the body with essential nutrients is crucial for optimizing athletic performance, growth, and recovery.

## METHODS

Relevant studies on nutrition among high school female athletes, including research on RED-S syndrome, were identified through electronic database searches using keywords such as "nutrition," "female athletes," and "Relative Energy Deficiency in Sport (RED-S)." Studies investigating dietary patterns, energy intake, macronutrient distribution, micronutrient status, and the prevalence of RED-S syndrome among high school female athletes were included.

## RESULTS

In high school, a significant number of girls engage in dieting practices to fit in with peer groups. Unfortunately, this pursuit of conformity often leads to the development of eating disorders, which are alarmingly prevalent. Many young athletes perceive their restrictive eating habits as intrinsic to their sport.<sup>3</sup> The most common eating disorders among athletes are anorexia and bulimia, although other unspecified disorders also arise.

Eating disorders not only affect an individual's physical health but also impact menstrual cycles and bone health, with these symptoms often occurring together. The Female Athlete Triad, established in 1992, illustrates the multifaceted nature of this disorder.<sup>2</sup> By prioritizing a robust nutritional foundation, athletes can adequately fuel their bodies to meet the demands of their sport.<sup>1</sup>

- Limited recent data on this specific topic, but resources like flyers and posters are available to raise awareness.
- Focus of eating disorder studies in the US predominantly on elite professional or collegiate athletes, with limited research on young high school athletes, although efforts by organizations like Gatorade aim to address this gap.

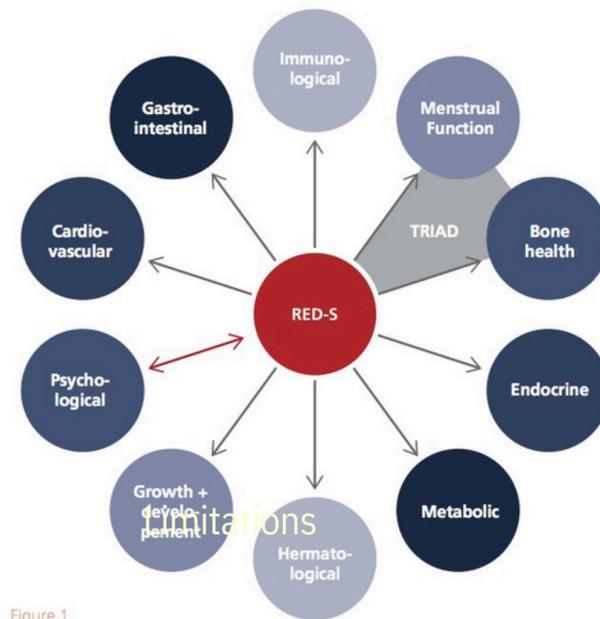


Figure 1

## CONCLUSION

Approximately 1 in 6 high school female athletes aged 13 to 18 experience an eating disorder, often without realizing it due to the energy demands of athletics.<sup>4</sup> Education on nutrition is vital for athletes, coaches, and parents to prevent eating disorders and encourage healthy lifestyle habits. However, barriers to addressing nutritional needs persist among high school female athletes:

- Limited nutrition education and resources hinder informed decision-making about dietary intake and RED-S prevention.
- Sociocultural pressures, body image concerns, and disordered eating behaviors contribute to suboptimal dietary intake and increase the risk of RED-S syndrome.
- The sports culture's focus on performance outcomes over athlete health can exacerbate RED-S syndrome risk by prioritizing weightmanagement and body composition goals. Shifting towards a holistic approach to athlete well-being is crucial for preventing and managing RED-S syndrome among high school female athletes.
- Recognizing the critical role of nutrition in the health and performance of high school female athletes is essential. Educating athletes, coaches, and parents about proper nutrition and the risks of RED-S syndrome is key to promoting optimal health, performance, and long-term well-being in this population.

### References

- Holtzman, B. & Ackerman, K., (2021). Practical Approaches to Nutrition for Female Athletes. *Sport Science Exchange*, 2021(34), 1-5.
- Heitmeyer, J. (2023) REDS: What the What and What Do I Need to Know? 2023 NSCA National Convention.
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- Melin, A. K., Heikura, I. A., Tenforde, A., & Mountjoy, M. (2019). Energy availability in athletics: Health, performance, and Physique. *Human Kinetics*, 29, 152-164. DOI: 10.1123/ijsem.2018-0201.



# Influence of Reward Timing on Spatial Learning: Gender Effects in Morris Water Maze



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## Introduction

Spatial learning and memory are fundamental cognitive processes that help an organism navigate and adapt to its surroundings. Spatial cognition in rodents is frequently investigated using behavioral tests such as the Morris water maze, which tests the ability to learn and remember the location of a hidden platform in a water-filled pool. Previous research has demonstrated that age, gender, and environmental stimuli can all influence spatial learning and memory abilities.

Using the Morris water maze test, we look at how gender and treatment timing affect spatial learning and memory performance in female mice. Specifically, we want to know whether there are gender differences in spatial navigation abilities and whether the timing of treat administration influences spatial memory formation. By addressing these objectives, we hope to contribute to a better understanding of the factors that influence spatial cognition in mice. (Nunez, 2008), (D'Hooge & De Deyn, 2001), (Li & King, 2019).



## Methods

In this study, female mice were assigned at random to different experimental groups. We used an octagonal dog pool filled with water and added low-fat milk powder to make it opaque, resulting in an appropriate shade for the Morris water maze test. During the procedure, mice were trained to find the hidden platform in the maze.

Treats were given before or after trials to see how treat timing affected spatial learning. Specifically, one group of mice received a treat at the start of each trial, and another group received a treat at the end. Latency was used to determine platform, path length, and other relevant metrics.

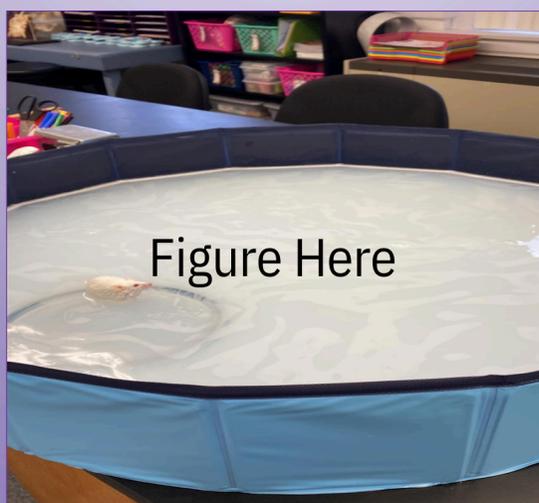


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## Results

Mouse A (Control Group) Trial Number	Path Taken	Proximity to Platform (cm)
1	Efficient path	48
2	Efficient path	58
3	Longer path	60
4	Longer path	56
5	Efficient path	54
6	Efficient path	50
Mouse B (Treatment Group) Trial Number	Path Taken	Proximity to Platform (cm)
1	Efficient path	45
2	Efficient path	58
3	Efficient path	60
4	Longer path	55
5	Efficient path	51
6	Varied path	20

The examination of trial data for Mouse A (Control Group) and Mouse B (Treatment Group) shows significant information about their performance in the Morris water maze. Both groups largely chose efficient paths in their trials, with Mouse B also demonstrating a diverse path trial. Mouse B had slightly higher navigation efficiency, as seen by a lower average proximity to the platform compared to Mouse A. These data point to a possible favorable effect of the treatment or condition administered to Mouse B. Additional study or trials may be required to validate these findings and make definitive conclusions about the treatment's impact on spatial learning and memory in mice.

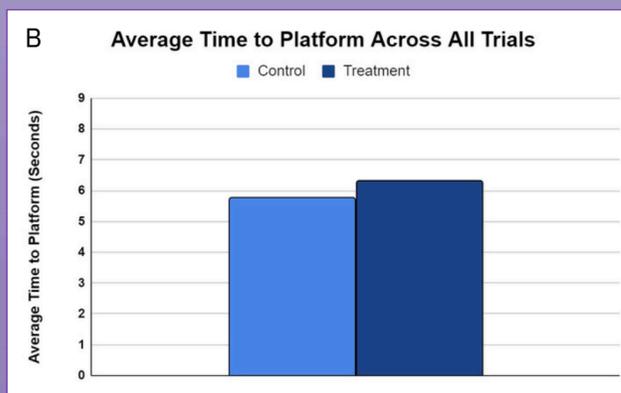
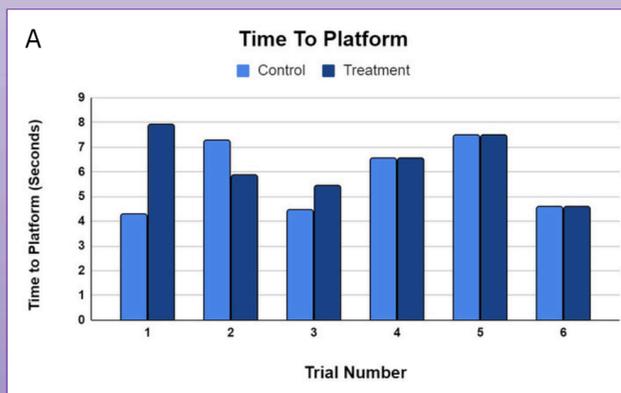


Figure 3. (A) The y-axis on the chart represents the "Time to Platform (Seconds)," while the x-axis indicates the "Trial Number." Each data point on the chart corresponds to the time taken by a subject from either the control or treatment group to reach a platform during a specific trial. For example, upon examining trial 2, it seems that the control group required more time to reach the platform compared to the treatment group. (B) The column chart visually shows how long it takes two groups of mice to escape in a Morris water maze test. On the chart, trial numbers are on the X-axis, and the time it takes to escape (latency) is on the Y-axis in seconds. Comparing the heights of the bars within each group across trials helps us understand how quickly they learn, with steeper drops meaning they learn faster. Comparing bar heights between the groups across trials helps us see if giving treats affects how well they learn the maze. If the group that gets treats consistently has taller bars than the group that doesn't, it suggests that treats might be influencing their learning and memory.



## Conclusions

Our study examined how offering treats before or after Morris water maze trials affects spatial learning in female mice. We discovered that the timing of rewards was critical in the mice's learning and memory processes. Mice who received treats at certain times performed better in terms of learning and memory retention than mice who did not receive treats or who accepted treats periodically. However, problems such as the loss of one mouse, limited means for procuring male mice, and the mice's occasional treat refusal influenced our findings. Moving forward, it is critical to acknowledge these limitations and explore treat types or delivery systems further to improve our understanding of reward-based learning behaviors in rodents. These findings provide useful information for future studies aimed at optimizing spatial learning methods in experimental settings.

## Acknowledgements

Thank you Dr. Sorrell for overseeing my experiment and taking care of my mice along with allowing me to use your lab. Thank you Dr. Griggs for providing the mice. Thank you to the Department of Biology for funding this project. Thanks to the mice for participating in this experiment

## References

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D'Hooge, R., & De Deyn, P. P. (2001, August). Applications of the Morris water maze in the study of learning and memory. *Brain Research Reviews* 36(1), 60-90. [https://doi.org/10.1016/s0165-0173\(01\)00067-4](https://doi.org/10.1016/s0165-0173(01)00067-4)

Li, A. W., & King, J. (2019, August). Spatial memory and navigation in ageing: A systematic review of MRI and fMRI studies in healthy participants. *Neuroscience & Biobehavioral Reviews*, 103, 33-49. <https://doi.org/10.1016/j.neubiorev.2019.05.005>



# Ethics Training: Higher Education v. Police Academy

Caia Bevins

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## Research Question

How does the ethics **training** that officers who attend police academies and the ethics **education** of students who earn a degree before going to the police academy compare? Is there an observable difference between the two education levels as time progresses?

## Background

Ethics training in police academies is typically **lecture-style** or is **discussion-based** (Wyatt-Nichol & Franks, 2010), and take up about **1.27%** of all training.

Ethics classes in college are typically a **hybrid** of lecture and discussion-based teaching and totals to around **45 hours** of education.

After leaving the police academy, ethics training is typically not offered regularly in the field and most departments said that the **training was optional** (Wyatt-Nichol & Franks, 2010).

The only time ethics training is usually required is when an officer is being **promoted** or has had **disciplinary action** taken against them (Villone, 2010).

Among the departments that did offer ethics training, most said they lasted **half a day**, and a few had a **full day** of training. These trainings were offered **every few years** (Wyatt-Nichol & Franks, 2010)

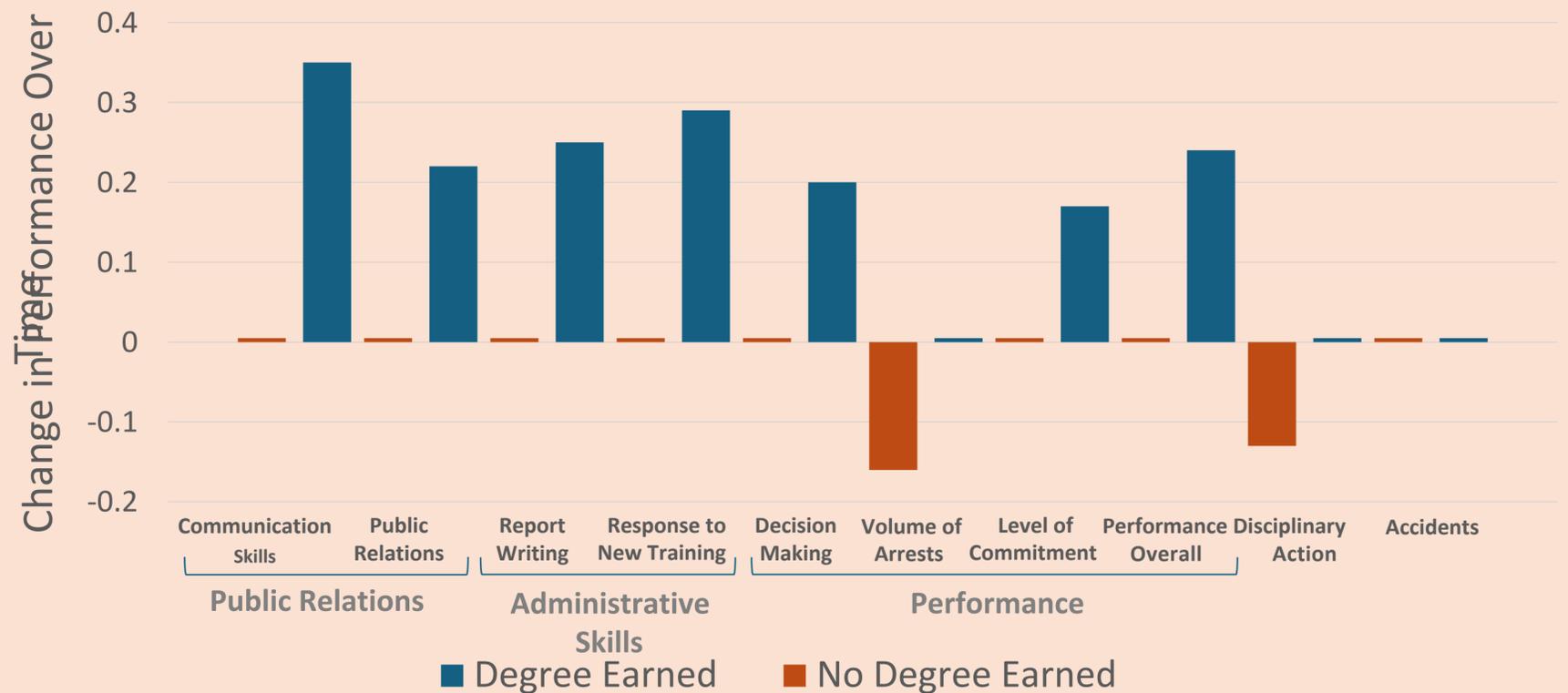
Both officers with degrees and those without experience this intermittent and often varying training that is offered. However, those with college degrees come in with **five times** as much ethics training, so they are infinitely more prepared to make ethical decisions in the field.

## Research

Wyatt-Nichol and Franks (2010) examine the types of training that police officers receive during and after attending the academy. Villone (2010) looks at the effectiveness of officers based on their education levels. Not only did he examine ethics, but also performance in things like administrative skills, public relations, disciplinary action, level of commitment, and overall performance as time progressed. His findings are graphically represented below.

## Conclusion

Based on the synthesis of these sources, as well as an analysis of the data, **there is a clear correlation between the performance of officers based on their education level.** Not only do officers with college degrees perform better in ethical situations, but also in general. They make more arrests, have better work ethic, and have less disciplinary action taken against them. This correlation can largely be attributed to the education they receive before going into the field.



## References:

Villone, E. J. (2010). Officers armed with degrees: Does n shield law enforcement officers complaints? *Youngstown State University*.  
 Wyatt-Nichol, H., & Franks, G. R. (2009). Ethics training in law enforcement agencies. *Public Integrity*, 12(1), 39-50. <https://doi.org/10.2753/pin1099-9922120103>

## Acknowledgement:

I would like to thank Professor Sondergaard for encouraging me to look into ethical training in more detail and Dr. Cain for helping me design and revise my poster. I truly could not have done this without either one and I am very grateful.



# Behind the Scenes: Empty Bowls 2024

Aubrey Bujalski, Major: Social Work, Minor: Psychology  
Professor Homier Salisbury

Empty Bowls: The DC SWK Program puts on an annual event where individuals from surrounding communities come and help support the homeless population by donating or purchasing a \$15 dinner that then gets donated to the Local Path Center

The Local Path Center: Partnership Assistance to the Homeless (PATH Center) is a soup kitchen/drop off center. This program serves people in the NWO population with severe mental disabilities, homelessness, or individuals with food or nutritional needs. A meal is served each weekday at noon. The program is funded in part by the Four County ADAMS Board and the United Way of Defiance County. Although they are only funded with \$1,000 for 365 days and rely heavily on donations from individuals and businesses in the area, they still try to make a great environment for those who are in need by having providing games and activities, friends, socialization, information on social services, guest speakers, free bread and bakery items as supply lasts, and morning coffee, juice, and rolls. For more information visit the NOCAC PATH center website: [https://unitedwaydefiance.galaxydigital.com/agency/detail/?agency\\_id=27661](https://unitedwaydefiance.galaxydigital.com/agency/detail/?agency_id=27661)

Students in part of the 2024 event: Libby Trejo, Sara Stark, Jessica Reynolds, Gabriella Herod, Kelly Limbaugh, Xavia Borden, Nicole Kuntz, Aubrey Bujalski, Taylor Greilich, Joshua Gase, kaitlin Paul, Gabriel Bookman, DaShaun Davis, with Professor Tess Homier Salisbury

Through a spreadsheet of past events, students called, emailed, and located businesses, individuals, and restaurants, to inform them of the event, asking for donations of soup, bread, utensils, desserts, salads, dressings, monetary, or anything else that could help with the event. Students then coordinated pick-up/drop-off times and locations for the donations.

During this event students split up SWK356: Practice II, into callers, logistics, and marketing. By doing so it helped students take control of what was needed from them. Students could work with other groups as the process went on but needed to ensure that their duties of what they were assigned were getting done as well.

Callers: examine spreadsheets from previous years to call individuals, businesses, and restaurants for donations of soup, breads, utensils, desserts, monetary, etc., that can help with the event along with the path center.

Marketing: Create fliers, emails, facebook posts/page, request letters, and represent the social work team during one-on-one interactions.

Logistics: Examine the spreadsheets to see pick-up, delivery, inventory, event layout, and flow of the event. Making things move smoothly and orderly.

EMPTY BOWLS 2024 is the 24th annual event taken place at the UAW Hall on April 16th, 2024. Volunteers from the Defiance College sports teams came together to help the Social Work team accomplish the event and stay true to our helpful College community.

Our number one goal is to help and raise awareness of our local PATH center and the homeless population. The group showed great assets for their future careers as Social Workers and couldn't have pulled it off without everyone by our sides.



Student Researcher: John Hammerstein  
Faculty Mentor: Olivia Lozar, Ph.D.

# Alternative Electromyography Replacement in Physical Therapy

## Exercise Science Program



## Background



Physical Therapy has evolved so much since the early 1900's. With the advances that have happened, Physical Therapy has allowed patients to recover and has helped people improve their everyday lives.



One instrument that can help is mTRIGGER Biofeedback Machine. mTRIGGER is part of the surface electromyography (sEMG) group when talking about biofeedback. This machine gets hooked up to the patient's muscle with electrode sensors. These sensors then give feedback on muscle contraction. These sensors also show how much the muscle is contracting and displays the measurements on an app that can be downloaded on one's device.



Although Biofeedback has been around for some time, since 1969 to be exact, the mTRIGGER machine has not been around for no more than 15 years.

## Purpose

With this machine being new, there has been interests in whether it is reliable and a potential valid replacement. Other may also want to know if the machine is worth a purchase. The purpose of this article is to learn and show more about whether or not the mTRIGGER machine can be reliable and a valid instrument to have for rehabilitation.

## Methods

In a study, scientists wanted to verify reliability and validity of the mTRIGGER device by comparing it to a high-quality Electromyography biofeedback machine used in laboratories (DELSYS electrodes). Instead of using the mTRIGGER for muscle injuries, they repurposed it to test it on healthy individuals and see how accurately it could read the muscle response to stimulation. There were 32 participants, aged 18 to 70, who each had the mTRIGGER and DELSYS electrodes placed on their calf muscles. Before starting the data collection, everyone had to walk for five minutes.

During the trials, participants walked for two minutes at different speeds (0.3, 0.6, 0.9, and 1.2 meters per second) on both solid ground and a treadmill. The walking speed on solid ground was measured using a metronome at the same speeds. Depending on the individual, a second trial was conducted either on the same day or within one week.

## Results

After completing all the tests, they discovered that mTRIGGER is a dependable and valid substitute for Laboratory Grade EMG. The accuracy of walking on a treadmill and solid ground was considered good to excellent and moderate to good, respectively. The consistency of walking on a treadmill and solid ground showed the following: treadmill walking had a high to very high correlation, while overground walking had a moderate to strong connection.

### Barriers to Current Literature

Because this topic is relatively new, there is not a lot of information or many studies conducted on mTRIGGER. While there are similar tools available, the mTRIGGER is affordable for many. It is important to note that in this study, some of the trials were conducted on different days. This could lead to varied results because there might be different activities or movements before each trial.

## mTrigger Device

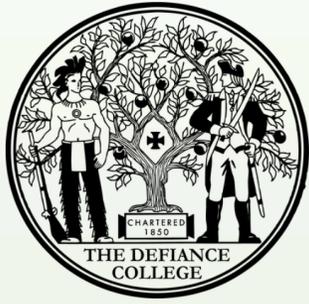


## Conclusion

- In conclusion, the researchers found the mTRIGGER machine is trustworthy and a good substitute for a Laboratory Grade EMG. It is not only reliable but more affordable, making it a good option for those looking for a cheaper alternative. While it might not be the best choice for advanced laboratory studies, the mTRIGGER is great for general Physical Therapy rehabilitation, offering accurate and precise feedback on muscle contractions.

## Reference

Koiler, R., Bakhshipour, E., Glutting, J., Lalime, A., Kofa, D., & Getchell, N. (2021). Repurposing an EMG biofeedback device for gait rehabilitation: Development, validity and Reliability. *International Journal of Environmental Research and Public Health*, 18(12), 6460. <https://doi.org/10.3390/ijerph18126460>



# Physical Activity & Mental Health in Children with Autism Spectrum Disorder

Gabriella Herod | Major: Social Work, Minors: Autism Studies, Exercise Science, & Psychology

Dr. Clarissa Barnes

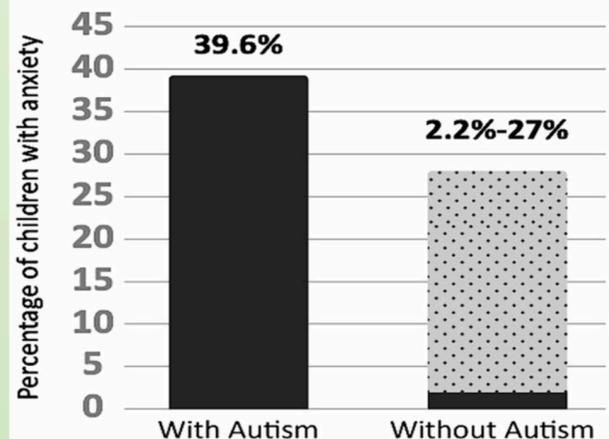
## Abstract

Individuals with Autism Spectrum Disorder (ASD) often struggle with several mental health disorders that seemingly could be improved or prevented. This research is tailored to looking at the connection between physical activity (PA) and mental health, as well as comparing differences between children with ASD and neurotypical children. This study also looks into how PA impacts a child with ASD's mental health in school, given children are in school for the majority of their day.

## Introduction

Autism spectrum disorder is defined as a developmental disability characterized by deficits in social interaction, communication, and the presence of restricted and repetitive behaviors (Hillier et al., 2020). Within this project, children are defined as individuals ages 1-17. The most common mental health disorders seen in both children with and without ASD are anxiety and depression. However, children with ASD are more likely to be diagnosed with a mental health disorder than their neurotypical peers (Whitney et al., 2019).

### Children with Anxiety Disorders



Lynch, C. (2021, January). *AUTISM advocate parenting magazine*. Autism, Anxiety, and the Five Prime Suspects, 7-9.

## Physical Activity

Physical activity guidelines are difficult to set as to how much PA is essential because each child's ability can vary significantly. According to the Children's Hospital of Colorado (2024), the requirements for PA in children are: Children ages 3 to 5-Be physically active most of the day through play and exploration. Children ages 6 to 17-Get at least one hour of moderate to vigorous physical activity each day, or seven hours per week.

## Mental Health

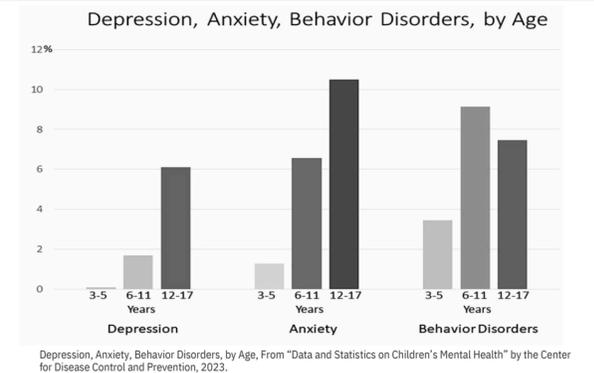
As for mental health, there is no universal definition; however, the most common and recognizable issues include anxiety, depression, and overall cognition (Biddle et al., 2018). There is an increased risk of depression and anxiety disorders for children with intellectual disabilities (Whitney et al., 2019). Anxiety and depression are the current mental health-related disorders with the largest growing and highest economic burden, affecting 2 to 4 million children in the U.S. (Whitney et al., 2019).

## PA & Mental Health In Schools

Children with ASD often demonstrate disruptive and unwanted behaviors at school, which is where they spend the majority of their day. Physical activity does not only help improve classroom performance, cognition, and behavioral function but it has also been proven to decrease stereotypical behaviors (hand-flapping, rocking, spinning, echolalia, etc.) in children with ASD. Decreasing the child's tendency to demonstrate these behaviors can improve their attention and engagement in the classroom (Oriol et al., 2020).

## Physical Activity to Improve Mental Health in Children with ASD

Physical activity is important for everyone's mental health. However, individuals with autism, of all ages, show further benefits from PA such as helping to reduce their unwanted behaviors and preventing further mental health difficulties such as anxiety and depression. Just like an autism diagnosis in each child looks different, the effects of physical activity on mental health look different in each child (Beron et al., 2016). Physical activity has proven to have positive effects on mental health, including both psychological health and cognitive functioning in children and youth with intellectual disabilities (Yang et al., 2022).



## Differences Between Children with ASD & Neurotypical Children

- Children with autism are less physically active and less physically fit in the strength domain compared to their peers without disabilities, which provides further evidence that children with ASD face increased levels of health disparities (Tyler et al., 2014).
- Physical and mental health conditions, particularly depression and anxiety, occur more frequently in individuals with autism than in the general population (Hallett, 2019).
- Physical activity looks different for children with autism than for neurotypical children. The duration, frequency, and intensity of physical activity are just a few examples of components that change from person to person.
- Studies have shown that children with ASD show more need for PA regularly because PA has been shown to attenuate ASD challenges, such as anxiety, stress, and sleeping difficulties (Hillier et al., 2020).

## Recommendations

- Talk with the child about the importance of physical activity on their body both physically and mentally.
- Set aside scheduled time for physical activity at both school and home. Incorporating physical activities into the child's daily routine will help make it manageable and enjoyable.
- Find physical activities that each child enjoys doing. If the child enjoys doing the activity, they will be more willing to participate. Examples: Jumping on the trampoline, swimming, riding a bicycle, and playing on a playground.

## References





# Are the New ACSM / NSCA Hypertension Guidelines Too Strict?



Defiance College Exercise Science Program: ESCI 256 (spring, 2024)

Student Researchers: Winter Boroff, Alex Jung, & Jalynn Parrett

Faculty Supervisor: Tim Rickabaugh, Ph.D.

## Purpose & Goals:

The guidelines for categorizing resting blood pressure (RBP) were changed in 2017, identifying elevated RBP as a systolic BP (SBP) greater than 120 mmHg and Stage One (mild) hypertension (HTN) as either a SBP greater than 130 mmHg or a diastolic BP (DBP) greater than 80 mmHg. This study was designed to collect accurate and reliable RBP measures on a mixed-gender, normally active, college-age population in order to determine any gender trends, RBP categorical differences, and issues related to height, weight, activity level, caffeine intake, or body mass index (BMI).

## Method:

Upon completing student training sessions, two RBP trials were conducted, a minimum of 24 hours apart, for each subject after lying supine for three minutes. Additionally, a brief survey was completed regarding gender, age, height, weight, minutes per week of physical activity, and daily intake of caffeine. Body Mass Index (BMI) levels were then calculated by student researchers. All methods, along with the informed consent form, were pre-approved by the Defiance College Institutional Review Board (IRB).



<b>RESULTS:</b>	<b>Total Subjects (N = 54)</b>	<b>Females(N = 22)</b>	<b>Males (N = 32)</b>
Age: (Mean +St. Dev.)	20.46 +1.20	20.50 +1.16 66.27	20.44 +1.32 69.02
Height (inches):	<b>69.02 +3.16 *</b>	+1.71 157.64 +26.27	+3.16 192.34
Weight (pounds):	<b>178.20 +40.81 *</b>	25.23 +4.06 385.91	+42.34 26.87
Body Mass Index (BMI):	<b>26.20 +5.34</b>	+187.71 1.09 +0.8	+5.89 376.56
Weekly Minutes of Activity:	380.37 +199.47	114.27 +5.50 67.45	+204.06 2.30
Caffeine Intake (12 oz. servings):	6.23	+3.19 121.00	+6.50 72.50 +8.93
Resting Systolic BP (SBP):	<b>1.81 +2.6 *</b>	-	-
Resting Diastolic BP (DBP):	<b>118.26 +7.01 *</b>	-	-
	<b>70.44 +8.40*</b>	-	-

**NOTE: \*= significant gender difference (p < .05, independent T-test)**

+++++			
#/% in Normal Range?	34 (63%)	18 (82%)	16 (50%)
#/% in Elevated Range?	15 (28%)	04 (18%)	11 (34%)
#/% in Hypertensive Range?	05 (09%)	00 (0%)	05 (16%)

## Conclusions:

- 1) The new RBP guidelines disproportionately increase the number of college-age males in the elevated (pre-hypertension) category.
- 2) Of the associations examined, body mass index (BMI) was the most powerful predictor of elevated resting blood pressure levels among all subjects.



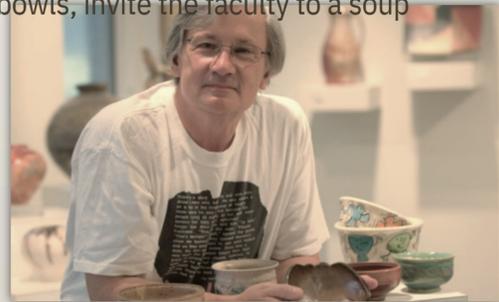
# History of Empty Bowls

Gabriella Herod | Major: Social Work, Minors: Autism Studies, Exercise Science, & Psychology  
Professor Tess Salisbury

## Missions Statement: "Think globally act locally"

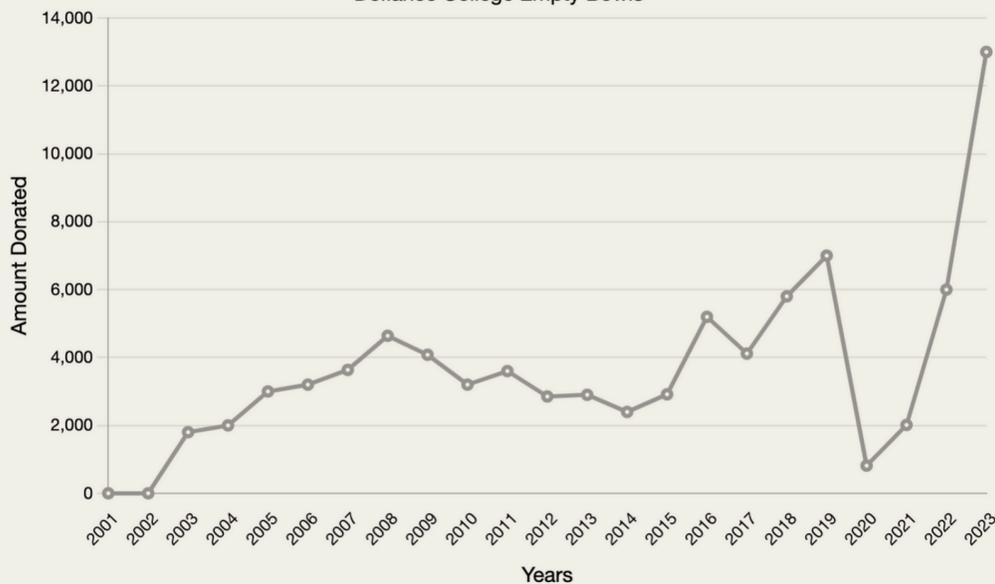
(Empty Bowls, 2023).

Empty Bowls is a global fundraising event held to support food-related charitable organizations around the world. This event was founded by John Hartom, an art teacher at Lahser High School in Bloomfield Hills, Michigan in November 1990 (Empty Bowls, 2023). Hartom developed a unique idea—students would handcraft ceramic bowls, invite the faculty to a soup lunch, and request donations. Hartom then asked the faculty to keep the handcrafted bowls as a reminder of those less fortunate (Empty Bowls, 2023).



John Hartom. From "John Hartom - Empty Bowls," 2023. EmptyBowls. Copyright 2024 Emptybowl by Zakra and WordPress.

Defiance College Empty Bowls



200	Unknown	200	\$3,63	201	\$2,90	201	\$7,000
1	Unknown	7	5	3	0	9	\$815
200	\$1,800	200	\$4,63	201	\$2,39	202	\$2,013
2	\$2,000	8	5	4	6	0	\$6,000
200	\$3,000	200	\$4,08	201	\$2,91	202	\$13,000
3	\$3,200	9	0	5	6	1	0
200		201	\$3,20	201	\$5,91	202	
4		0	0	6	7	2	
200		201	\$3,60	201	\$4,11	202	
5		1	0	7	5	3	
200		201	\$2,85	201	\$5,80		
6		2	2	8	1		

The Defiance College (DC) Social Work Organization and Religion organization brought this growing fundraiser to the Defiance, Ohio area in 2001 to raise funds to help the Northwestern Ohio Community Action Commission Inc. (NOCAC)'s Path Center. The Path Center is a soup kitchen/drop-in center that serves approximately 600 meals each month to the homeless population, individuals who struggle with mental illness, and individuals with nutritional needs (NOCAC, n.d.). The Path Center is only allotted \$1,000 each year, which is the reason they run almost solely on donations.

Over the past 23 years, the Defiance College Social Work students have raised more than \$85,000 for the local Path Center with 2023 being their largest donation to date at \$13,000. The Empty Bowls event in Defiance was originally held at the United Church of Christ on campus but quickly outgrew that location and was changed to the Knights of Columbus Hall in Defiance. The 24th annual Empty Bowls event is in the works to be held on April 16th, 2024, at the UAW in Defiance, Ohio. This event brings people from the surrounding counties together for one common purpose. Each year all of the soup, salad, bread, and desserts are donated from local food establishments.

Brandon Knott, Defiance College alumni, began making the event's ceramic bowls between 2016-2017. Knott was the perfect person for this as he is also the owner of It's Knott Pottery.



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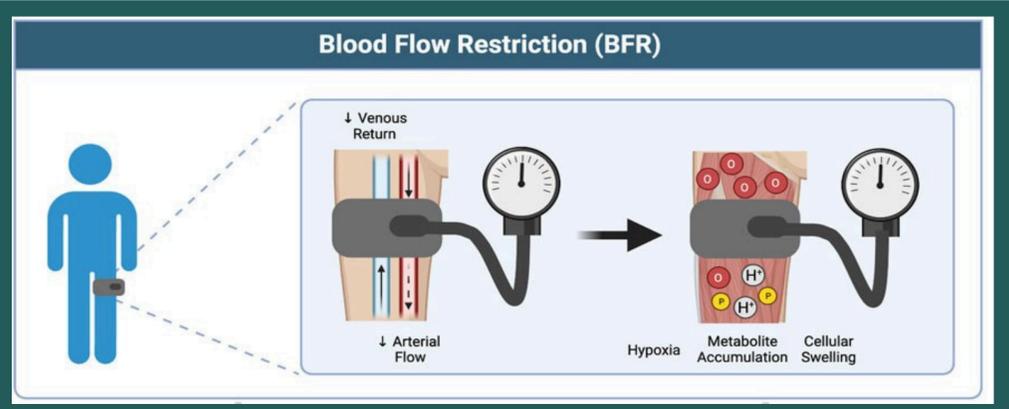
## Introduction

Blood flow restriction (BFR), also known as occlusion training, has emerged as a valuable technique in exercise and rehabilitation settings. By applying a specialized cuff to a limb, arterial blood flow is partially restricted while maintaining venous blood flow during resistance exercise. This creates a localized hypoxic environment in the muscles, stimulating adaptations and strength gains. BFR training facilitates early initiation of resistance training in rehabilitation, aiding muscle recovery and strength gains while minimizing the risk of further injury.

BFR therapy has gained traction in musculoskeletal injury rehabilitation, offering a safer yet effective approach for individuals unable to tolerate higher force, pressure, or weight. Originating in Japan, BFR therapy has evolved significantly since its inception in 1998. It allows for targeted muscle strengthening post-injury without overloading tissues, promoting faster and more effective recovery. Physiological adaptations, such as muscle hypertrophy and strength increases, result from metabolic stress and mechanical tension induced by BFR. Despite some conflicting events reported in studies, overall, BFR has shown promise in enhancing muscle growth and strength gains, particularly in resistance training programs. This introduction sets the stage for exploring the multifaceted benefits and applications of BFR therapy in rehabilitation and exercise physiology.

## Methods

Relevant studies were identified through electronic database searches using keywords such as "blood flow restriction," "physical therapy," and "rehabilitation" from the past decade. Studies directly examining the impact of BFR in therapy sessions for individuals of all ages were considered. Common protocols involve occluding the limb during exercises such as bicep curls, followed by rest intervals.



## BFR Utilization

### Passive BFR

**Passive Occlusion:** In passive BFR, specialized cuffs are applied to the limb without engaging in active movement or exercise. The cuffs are inflated to partially restrict arterial blood flow while allowing venous return, creating a localized hypoxic environment in the muscle tissue. This passive occlusion technique can be used in conjunction with other interventions, such as neuromuscular electrical stimulation (NMES).

**Neuromuscular Electrical Stimulation (NMES):** NMES involves the application of electrical impulses to stimulate muscle contraction. When combined with passive BFR, NMES can enhance muscle activation and promote muscle strength and endurance without requiring active movement from the individual. The localized hypoxic environment induced by BFR augments the physiological response to NMES, leading to greater muscle adaptation and rehabilitation outcomes.

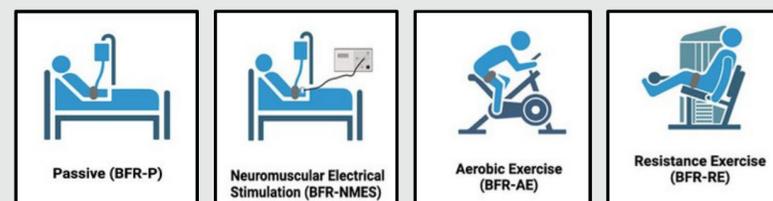
### Active BFR

**Aerobic Exercise:** Active BFR involves performing aerobic exercises, such as walking or cycling, while the limb is occluded. The restriction of blood flow during aerobic exercise creates metabolic stress in the working muscles, eliciting adaptations similar to those observed with high-intensity aerobic training. Active BFR can enhance cardiovascular fitness, endurance, and metabolic efficiency, making it a valuable tool for individuals seeking to improve their aerobic capacity.

**Resistance Exercise:** Resistance training with BFR involves performing low-intensity resistance exercises, such as weightlifting or bodyweight exercises, while the limb is occluded. The partial restriction of blood flow during resistance exercise enhances muscle activation and metabolic stress in the target muscles, leading to muscle hypertrophy and strength gains. BFR allows individuals to achieve significant muscle adaptations with lighter loads, making it particularly beneficial for rehabilitation and strength training in populations with limited mobility or musculoskeletal injuries.

## Barriers to the Literature

Despite its potential benefits, barriers to the widespread adoption of BFR therapy in orthopedic rehabilitation include a lack of research studies, inconsistency in protocols, and mixed results. Further investigation and standardization of protocols are necessary to establish BFR therapy as a safe and effective intervention postoperatively.



## Conclusion

BFR therapy offers a promising approach to rehabilitation by enhancing muscle growth and strength with lighter loads, potentially benefiting individuals recovering from injuries or surgeries. However, further research is needed to fully understand its long-term effects, safety, and optimal application in different populations and athletic contexts.

By incorporating BFR into both passive and active modalities, clinicians and researchers can optimize its therapeutic effects and tailor interventions to meet the specific needs and goals of individuals undergoing rehabilitation or performance enhancement programs.

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# Sensory Intervention in Children with Autism Spectrum Disorders

Student Researcher: Kendra Kline Faculty Mentor: Olivia Lozar, Ph.D.

Defiance College Exercise Science Program



## Introduction

 Autism Spectrum Disorder (ASD) is a neurodevelopmental condition that affects individuals' perception, socialization, and communication. It can present challenges in interacting and connecting with others.

 ASD falls under the umbrella of neurodivergence, indicating cognitive and neurological variances among affected children.

 Neurodivergent individuals often experience sensory processing differences –ultimately impacting how they perceive and interact with the world around them.

 Sensory Motor Interventions can be utilized in Occupational Therapy by involving activities that are believed to organize the sensory system of a child by improving self-regulation while also providing auditory and tactile inputs.<sup>1</sup>

This literature review aims to describe how sensory interventions can be beneficial for children with ASD and sensory issues, as well as also improving postural control, motor skills, and sensory integration.

## Findings

Ouellet et al. demonstrated the effectiveness that sensory motor interventions provide to children with ASD by having different control groups within the study. These groups consisted of a sensory-based approach that had each child wear a weighted vest of between 5-15% of their body weight and then tested whether wearing a weighted vest affected their task engagement behavior.

*It was found that stereotyped behaviors decreased during the weighted-vest condition for one child.<sup>2</sup>*

Another control group that was tested was using therapy balls for ASD children. Three low-to-moderate studies used these therapy balls and 2 of them showed an improvement.

*Results from this type of design are difficult to generalize because of the small sample size and variability of sensory characteristics of the participants.<sup>1</sup>*



## Literature Barriers

Sensory motor interventions are regularly given and assessed during occupational therapy but within this literature review, it was mentioned that these therapy sessions could also be delivered by teachers during class times. The barrier with this is that their application could be influenced by the teacher's interest in and their beliefs regarding the specific approaches such as therapy balls and weighted vests. Barriers that also exist use the same treatment type for all children. No child is the same as another, so it is not helpful to children with ASD to all be treated the same and many studies provide the same therapies to all children and conclude that there were no significant improvements.

## Conclusion

Occupational Therapists commonly use sensory motor interventions for children with ASD to address their sensory-processing differences. These interventions are used to help children organize input and perform daily activities –which is the sole purpose of occupational therapy.<sup>3</sup>

It was proven within these literature reviews that not all sensory motor interventions are equally effective for all children diagnosed with ASD. It is crucial that occupational therapists can match the interventions they are performing with the specific needs of each child to allow for the best possible results.

## Methods

For this literature review, relevant studies were identified through electronic database searches. Keywords including “Autism Spectrum Disorder”, “self-regulation”, “occupational therapy”, and “sensory motor intervention” were used to find relative articles from recent years. Studies that were used were those that directly studied the impact of sensory motor interventions within children that were diagnosed with ASD and the effects that the sensory motor interventions had during occupational therapy.

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# ACL INJURIES AND RECOVERY

Defiance College Exercise Science Program



Student Researcher: Zakary Klopfenstein Faculty Mentor: Olivia Lozar, Ph.D.

## PURPOSE

The purpose of this academic poster is provide an overview of Anterior Cruciate Ligament (ACL) injuries as well as ACL anatomy, treatments, and recovery related to the ACL. This poster aims to educate athletes and coaches about complexities that are associated with ACL injuries.

## ANATOMY OF ACL

The knee joint is made up of 4 ligaments, the ACL, PCL (Posterior Cruciate Ligament), MCL (Medial Cruciate Ligament), and the LCL (Lateral Cruciate Ligament). The ACL connects the femur to the tibia. More specifically, the ACL “originates on the medial wall of the lateral femoral condyle and crosses anteromedially to its insertion on the anterior aspect of the tibial articular surface”.<sup>1</sup>The ACL is made up of two bundles: the anteromedial (AM) and the posterolateral (PL). The primary biomechanical functions of the ACL include stabilizing the knee as well as resisting hyperextension, anterior tibial translation, and rotary movements.<sup>1</sup>

## ACL INJURY

✗ The anterior cruciate ligament (ACL) is a critical structure in the knee joint, providing stability and support during dynamic movements. However, ACL injuries are prevalent, particularly among athletes participating in high-demand sports. Understanding the mechanisms underlying ACL injury, as well as the associated risk factors, is essential for developing effective prevention and rehabilitation strategies.

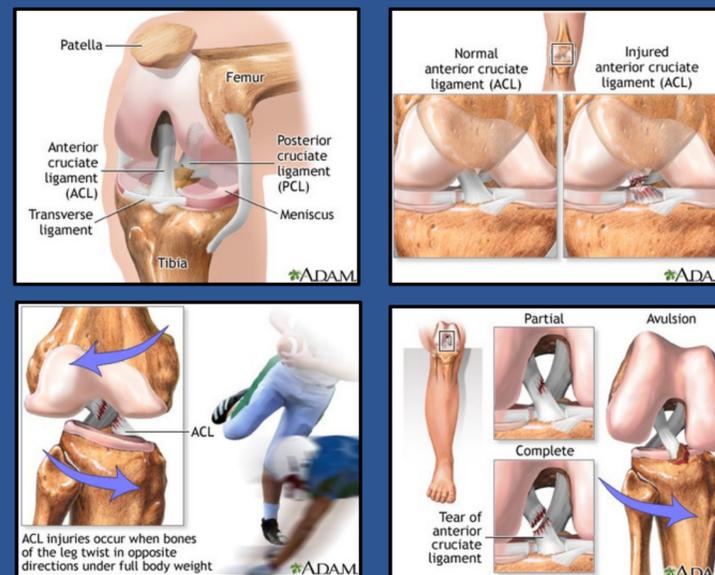
👤 ACL tears are the most common knee injury, which typically requires a surgical reconstruction and rigorous rehabilitation. “Approximately 250,000 ACL tears are estimated and 100,000 reconstructions are performed annually in the United States”.<sup>1</sup> With ACL tears being so common, there has been much research done to find the best prevention and rehabilitation techniques that help improve the overall health of athletes.

👤 ACL's are most commonly injured while performing non-contact movements (70%-80% of cases).<sup>2</sup>These injuries often occur after sudden movements such as landing from a jump, making a sudden cut or change of direction, and sudden decelerations. Injuries are also possible from receiving a direct impact to the knee, such as a tackle in football.<sup>2</sup>Types of injuries to the ACL include a stretched ligament, a partial tear, or a tear.

## TREATMENT AND RECOVERY

⊕ With most ACL tears, surgery is the most common option for treatment. Surgery is usually recommended to athletes who want to return to sport, more than one ligament in the knee is injured, or if the injury is causing your knee to buckle during normal activities.<sup>2</sup> During reconstruction, the surgeon removes the ligament and replaces it with a graft (a segment of a tendon or tissue that is similar to the ACL). After surgery, one of the recommendations is to “establish timelines to establish realistic goals and expectations”.<sup>3</sup>

📅 Establishing clinical milestones can allow the medical staff and patient to encourage the correct rehabilitation of the ligament by gradually pushing the limits of what the healing knee can accomplish. Although there is no set time from for the rehabilitation process, medical professionals will perform many different tests to determine if the patients is fit to return to play.



## PREVENTION

Preventing ACL injuries has become a focal point of research due to their prevalence. This has prompted the exploration of various prevention techniques within fitness, strength, and conditioning programs. Strengthening the core and leg muscles is one focus of prevention. Focusing on strengthening the quadricep and hamstring muscles will best help prevent injury by improving strength and balance throughout the legs. This not only enhances overall leg strength but also improves balance and reduces the risk of inward knee rotation during high-impact activities like squats and jumps.<sup>2</sup>

Emphasizing proper technique is another preventative strategy. Practicing good technique for high impact movements such as jumping, cutting, and deceleration can help reduce the chance of an ACL.<sup>2</sup>

Educating athletes on the importance of these techniques raises awareness and empowers them to proactively decrease their ACL injury risk. By integrating these strategies into training regimens, athletes can significantly reduce their susceptibility to ACL injuries and enhance their overall performance.

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# An Overview of Cupping

Defiance College Exercise Science Program

## Background

- ⊕ Within the practice of Physical Therapy, there are many methods of treatment that come and go based on the always evolving medical field. Cupping therapy stands out as one of the oldest known methods of treatment, originating from traditional Chinese medicine dating back over 2,000 years to the early fourth century. Cupping is a form of alternative medicine that has been used in the treatment of a broad range of conditions. It is performed by applying local suction on the skin with plastic or silicone cups. The most popular methods of cupping are known as dry cupping and massage cupping, while another method is wet cupping.

## Purpose

While cupping therapy has been around for quite some time, it is still used to this day due to the healing it provides for patients. A common question that may be asked is how does it work and what is the effectiveness of doing so. The purpose of this poster is to provide a better understand of what cupping is and the benefits it has to offer for different injuries.



## Methods

For this literature review, relevant studies were identified through electronic database searches. Keywords including "modern cupping therapy," "the efficacy of cupping therapy," and "education of cupping therapy and associated theories" were used to find relevant articles from the past 10 years. Studies were considered that gave baseline cupping methods, statistics and substantial evidence of cupping being a successful method of treatment. The perspective study gives a better overall understanding of what exactly cupping therapy is and how it works. 1 The efficacy study searched for previous random controlled studies (135) that were performed and combined results for and overall statistic in success treating different diseases. 2 The educational study allows differentiation between techniques and specific indications. 3

## Findings

Significant findings and information were provided in each of the studies that supported the success of cupping, backed by growing evidence of potential benefits.

- In the perspective overview study, it explains that cupping can be used for health promotion, preventative and therapeutic purposes. 1 It then goes on to split the treatment of diseases into two different categories, being localized diseases and systematic diseases. The findings within the perspective study are the preventable (scar formation, burns, abscess and skin infection, and anemia) and nonpreventable adverse events (headaches, dizziness, tiredness, nausea, insomnia). 1 In the efficacy study there was a total of 56 different diseases or symptoms treated, with the six most common ones being herpes zoster, facial paralysis, cough and dyspnea, acne, lumbar disc herniation and cervical spondylosis. 2 The study also stated, "133 of the 135 included studies showed that cupping as well as cupping combined with other treatment were significantly effective for certain diseases". 2
- In the educational study, it addressed cupping types/sets, techniques on how to use them or what to use them on, and the positive/negative reactions to using them. 3 Furhad et al. stated, "cupping therapy has demonstrated notable advantages in addressing forms of pain, particularly musculoskeletal pain, migraines and tension headaches." Other than alleviating headaches, it is also proven to be used for arthritic, neurotic and musculoskeletal pain affecting the trunk, extremities and neck. 3

## Barriers

A few barriers to research presented is that the efficacy study pulled results from studies that were done from 1992 through 2010, meaning any recent evidence or findings have been excluded. 2 The efficacy study also stated, "further rigorously designed trials on its use for other conditions are warranted." 2 The perspective study stated, "evidence supporting its effectiveness for most medical disorders remains limited". 1 Ultimately, there is room for more research, just in general and for unspecified diseases. Another barrier within these studies is biasness, especially in the perspective study which stated, "of the 135 RCTs in this review, 84.44% were high risk of bias". 1 Future research should be carefully designed to avoid bias.

## Conclusion

Substantial evidence has been provided to demonstrate that cupping therapy is an effective way to manage pain and increase living health. Furthermore, cupping has not only been utilized to treat physical injuries, but it can also be used to help treat certain diseases that may affect everyday living. Though cupping may not be a cure for any of the mentioned injuries or diseases, it can be used to relieve a patient for periods of time. Cupping is regarded as a complementary therapy rather than a substitute for conventional medical treatments. A note to add is that cupping therapy is not a cure, and it is not a replacement for conventional treatment. Many patients complete other therapies or receive other treatments in combination with cupping to enhance results. It should also be noted that cupping therapy comes with contraindications and adverse events, meaning not all patients received the same benefits and success.

## References

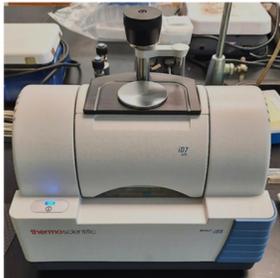
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# The Detection of Common Drugs of Abuse on United States Banknotes using Fourier-Transform Infrared Spectroscopy (FT-IR)

Olivia Rayk and Dr. Nathan Griggs, Advisor



## Introduction



- FT-IR is used to identify the chemical properties of a substance
- Infrared Radiation either passes through or is absorbed by the sample
- A detector interprets the signal to produce an absorbance spectra
- Solids, Liquids, and gases can be assessed

Figure 1. Nicolet™ iS™ 5 FTIR Spectrometer

- About 27.2 million United States citizens 12 years old or older reported having a drug use disorder
- About 1.4 million Americans 12 years old or older reported a cocaine use disorder
- The most abused prescription medications were painkillers

## Methods

### Obtaining Reference Spectra

- Aliquots of the Cerilliant reference materials for drugs of abuse were placed directly onto the ATR diamond crystal
- 40 Scans were conducted for each sample
- Samples were concentrated by placing amounts into ceramic wells and allowing the methanol to evaporate

### Extraction from the Banknotes

- Place the bill into a 15 ml centrifuge tube and cover with methanol
- Invert continuously for one minute
- Remove bill and extract fluid, place onto ATR to be assessed
- Take 5 ml of fluid from centrifuge tube and place into 5 ml beaker, set aside to allow methanol to evaporate
- Add minimal amount of methanol to allow the sample to be assessed, perform scan
- This process was repeated for each banknote



Figure 2. 15 ml centrifuge tubes, ceramic wells, and 5 ml beakers containing extractions from banknotes

## Materials

- Nicolet™ iS™ 5 FTIR Spectrometer
- Cerilliant reference materials for drugs of abuse
- Ceramic well plate, 15 ml centrifuge tubes, 5 ml beakers
- Methanol
- Three \$1 bills, one \$5 bill, one \$10 bill, one \$20 bill

## Results

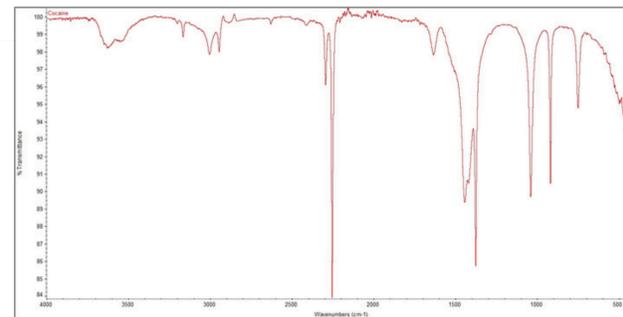


Figure 3. Cocaine

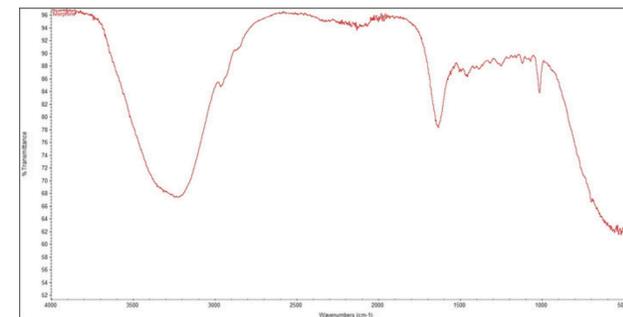


Figure 4. Morphine

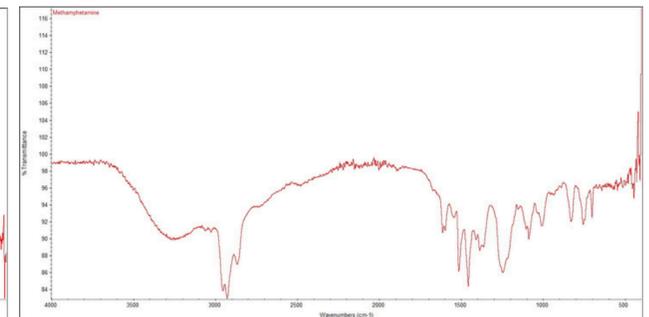


Figure 5. Methamphetamine

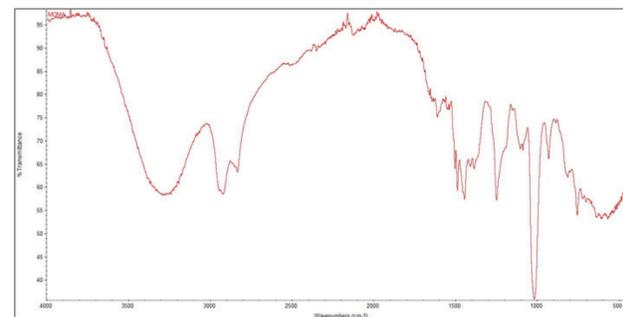


Figure 6. MDMA

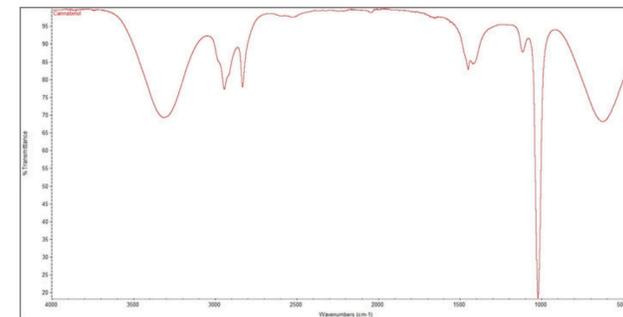


Figure 7. Cannabinol

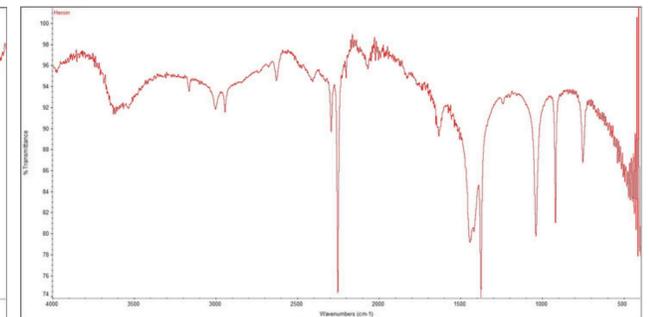


Figure 8. Heroin

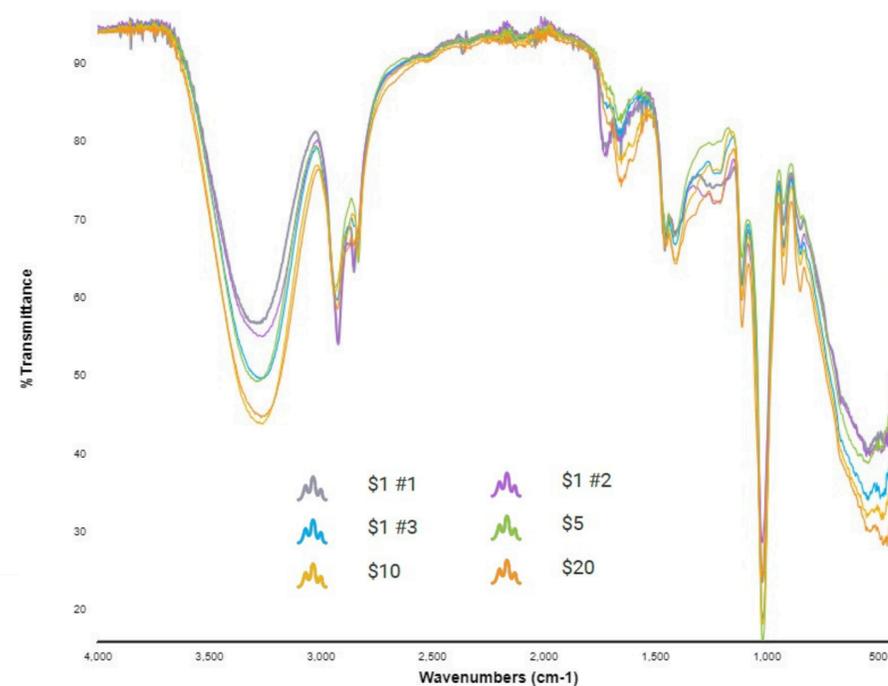


Figure 9. IR spectrum data for all banknotes

## Discussion

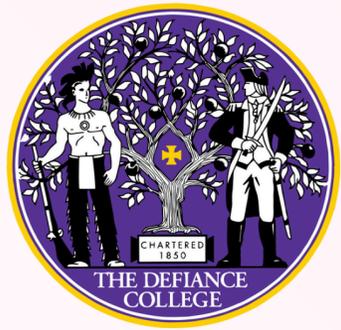
- FT-IR Spectroscopy was used to create absorbance spectrum for the following drugs of abuse: cocaine, morphine, methamphetamine, MDMA, cannabinol, and heroin (Figures 3-8).
- Figure 9. displays the result of the extraction from the banknotes; the presence of methanol can be confirmed by this spectrum. The presence of any of the drugs of abuse cannot be confirmed by Figure 9.
- One possible explanation is that the methanol extraction was not successful in removing the drugs from the banknotes.
- Another possible explanation is that there was not a significant amount of drugs present on the banknotes.
- If this experiment were to be conducted again, it may be beneficial to use a larger sample size and to use GC-MS along with FT-IR.

## Acknowledgements

- Dr. Griggs, project advisor
- Dr. Sorrell, academic advisor
- Funding for this project provided by Defiance College's Forensic Science Program

## References

National Survey on Drug Use and Health (2022)



# The Benefits of Pediatric Physical Therapy for Children with Autism Spectrum Disorder.

Brooke Silcox | Major: Exercise Science, Minor: Autism Studies

Dr. Clarissa Barnes

## Introduction

Autism Spectrum Disorder (ASD) is a developmental disorder indicated by difficulties with social interactions and communication and restricted or repetitive behaviors and interests (Srinivasan et al., 2014). Delays in motor skills are common for children with Autism Spectrum Disorder, and this is why most families reach out to a physical therapist to resolve those concerns. A Pediatric Physical Therapist aims to help children improve strength, balance, and motor skills through activities and structured exercises. Deficits in motor control can lead to decreased social interaction and participation in physical activities. Physical Therapy can benefit children with Autism Spectrum Disorder by developing gross motor skills, sharing the importance of pediatric PTs, and improving their quality of life.

## Recommendations

Pediatric physical therapists give children with ASD the opportunity to develop gross motor skills to improve overall physical and mental well-being. With the help of pediatric physical therapists, children with ASD can improve their gross motor movements to meet personal goals. Some recommendations for caregivers and pediatric physical therapists include:

- Balance rehabilitation programs: Successfully improve balance and coordination and help improve daily activities at home or school.
- Education for pediatric physical therapists: Pediatric physical therapists are likely to work with children with ASD. It is beneficial to be educated on ASD in order to provide the best treatment necessary for that individual.
- Deficits in gross motor movement: If a child with ASD has difficulties with gross motor movements, the parents or caregiver must seek the help of a physical therapist to resolve those concerns.

## Development of Gross Motor Skills

Children with Autism Spectrum Disorder may experience gross motor developmental delays that affect walking, running, jumping, and skipping. Gross motor movement requires large muscle groups to work together to perform a movement. Physical therapists are movement experts who help the child develop those gross motor skills so that the child can participate in everyday activities. Some factors that contribute to the delay of developmental gross motor skills include:

- Hypotonia or low muscle tone: It is common to see low muscle tone in children with ASD. Muscle tone is described as the tension the muscle has while at rest. Low muscle tone can cause poor posture, increased injury likelihood, and increased flexibility (Lopez-Espejo et al., 2021). Low muscle tone cannot be changed; however, strengthening the muscle can help achieve daily tasks.
- Balance: Balance refers to being able to stay upright and stay in control of the body. Children with ASD often struggle with balance and gaining control of their bodies (Roşca et al., 2022). Balance rehabilitation training programs have proven to be successful in gaining more control over the body.
- Coordination: Coordination is the ability to move two or more body parts under control. Children with ASD can struggle with coordination, and that can lead to decreased physical activities with their peers. Equine-assisted therapy has been shown to increase upper limb coordination and improve gait patterns (De Milander et al., 2016).

There are many ways that pediatric physical therapists can treat these kinds of conditions, such as balance rehabilitation training, water therapy, equine-assisted therapy, strengthening programs, and working on the child's specific goals, such as riding a bike or throwing a ball.

## The Importance of Pediatric PTs

Pediatric physical therapists are trained to observe and work with a child's development. Working closely with children, pediatric physical therapists can be trained to identify the early indications of ASD and help with the diagnosis process.

- Education: In the study conducted by Ben-Sasson et al. (2018), pediatric physical therapists were trained in ASD screening for early identification to gain more knowledge about ASD and be able to provide treatment in ways necessary for the child.
- After the study concluded, the researchers found that the pediatric physical therapists participating had gained more knowledge about ASD and felt more comfortable in their abilities to provide the best treatment (Ben-Sasson et al.).

Clinicians can rely on physical therapists to help aid in diagnosing ASD. Physical therapists can also take on the role of educating the parents, teachers, and the community about how ASD can affect children physically.

## Co-Treatment

Physical therapists can work closely with other professionals, such as occupational and speech-language pathologists. Co-treating is a widespread technique where two different therapists can treat the same patient to make faster progress and meet goals (Yingling & Bell, 2020).

- Physical therapists and speech-language pathologists: Help the child follow multiple-step directions while performing movements or structured activities (Yingling & Bell).
- Physical and occupational therapists: The occupational therapist can teach a life skill to the patient, and the physical therapist monitors and assesses the movements and determines if equipment is needed to help the patient accomplish the skill.

## Improved Quality of Life

Individuals with ASD can experience difficulties with social and emotional interaction and have difficulty participating in physical activities with their peers (Cynthia et al., 2019). Working with physical therapists gives the individual the opportunity to improve gross motor development and have the ability to be able to participate in physical activities.

- Physical activity increases strength and motor control, reduces stress and anxiety, and increases self-esteem (Cynthia et al.).
- Physical activity has also been shown to improve communication skills, increase attention span, decrease self-injuring behaviors, and boost performance on cognitive tasks (Cynthia et al.).

Although improved quality of life is subjective, from a physical therapy standpoint, documenting the progress and meeting the goals of a child with ASD can be seen as improving their quality of life since the individual is getting stronger and can perform tasks that they could not complete before treatment.

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# Click or Craft:

## Identifying the differences between computer-based and hands-on student learning and content retention

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### Background

#### The importance of science education:

- ★ Science readiness scores are lower than any other academic subject area<sup>8</sup>
- ★ Children with gaps in science knowledge rarely catch up, leaving deficits that limit children's future academic career choices<sup>7</sup>
- ★ Science teaching has shown potential in achieving gains in reading and writing<sup>6</sup>
- ★ Rural schools are especially challenged in meeting educational benchmarks for science and mathematics<sup>5</sup>
  - o(a) geographic isolation (b) fewer experienced teachers (c) fewer resources<sup>5</sup>
  - oCompared to suburban peers, students from rural and small-town schools are significantly less likely to enroll in postsecondary STEM degree programs<sup>4</sup>
- ★ In a study conducted on fourth graders, no significant differences were found between science processing skills and gender; significant differences were found between science processing skills and the school attended<sup>3</sup>

#### Computer-based versus hands-on instruction:

- ★ Differentiated instruction transforms learning to be more individualized<sup>2</sup>
- ★ Implementing hybrid systems can add the pros of certain instructional techniques and minimize the cons<sup>1</sup>

### Research Objective

Are there differences in student learning and retention of science content when engaged in hands-on versus computer-based activities?

### Methods

A STEM summer camp was held for a week (five days) for seven hours a day. Three hours a day were dedicated to topic introduction and hands-on activities. The other three hours were for technological instruction. One hour was left for lunch. Students were of mixed ages (9-14 years) and different gender orientations.

Students were asked to complete Doodle Notes after hands-on activities and after computer-based activities on the same topic. Doodle Notes were then analyzed to determine what content students were able to retain accurately during each portion.

### Camp Days

<b>Monday</b>	<i>Biodiversity</i>	Biodiversity board game, Clay animals, Biodiversity BINGO, Extinction Rollercoaster, Extinct Animal Creation
<b>Tuesday</b>	<i>Biology</i>	Gene bracelets, Pixelated selfie, Strawberry DNA extraction, SuperFight, Biodiversity/ Extinction! map and free-play
<b>Wednesday</b>	<i>Space</i>	Color the planets, Design a theme park, Space BINGO, Moon rock treasure hunt, Build a theme park
<b>Thursday</b>	<i>Energy &amp; Bees</i>	Build a solar oven, Build a beehive, Model solar system, Sustainable Town
<b>Friday</b>	<i>Chemistry</i>	Chemistry BINGO, DIY Fruit Juice Sorbet, Mini pyrotechnics simulation, Exploding Creepers, Periodic Table of the Elements scavenger hunt



### Results

Amount of Doodle Notes Filled Out	<i>Biodiversity</i>	<i>Biology</i>	<i>Space</i>
<i>Nothing</i>	9	6	3
<i>Something</i>	7	3	11
<i>Everything</i>	6	16	10

### Discussion

#### DOODLE NOTES:

Doodle Notes add a level of structure and specificity to note taking however they are often vague, leaving room for the students to identify what is important to write down. Students may not understand the purpose of the Doodle Notes and therefore, may not use them correctly. Because each lesson is varied, each Doodle Note will also be varied and not standardized. This makes evaluation of content retention difficult.

#### MINECRAFT EDUCATION:

Students of all ages love Minecraft and they offer an educational version for teachers to use in their classroom, however, the application lacks lessons and mods and has limited science content. Students are captivated by the gamification of learning but many lacked coding knowledge and experience with the app making it difficult for them to using the application.

#### IMPORTANT LESSONS:

Research calls for having well defined data collection tools and Doodle Notes are not very good data collection tools but are useful for engaging students in content learning. If we had a week to test run our data collection, as well as our activities, we likely would have had a smoother second week (this was done in 2022).

#### LIMITATIONS:

Limitations included getting quantifiable data while trying to make summer camp fun, students had no incentive to complete the Doodle Notes, and students and faculty had different levels of technological knowledge: Console vs PC.

### Conclusions

Unfortunately, the data collection on this project was limited due to the nature of Doodle Notes. Differences between student content retention for computer-based and hands-on learning was determined to be inconclusive due to the lack of data. Further research with improved data collection methods would be needed in order to draw conclusions.

### Acknowledgements

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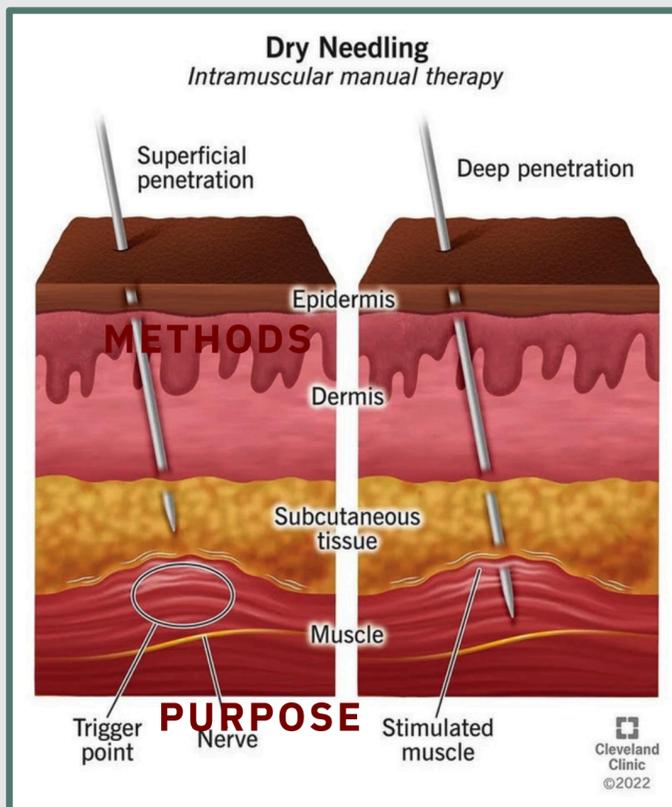
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# Effectiveness of Dry Needling with Distinct Injuries

Student Researcher: Adam Tobin Faculty Mentor: Olivia Lozar, Ph.D.

## BACKGROUND

Dry needling therapy, developed by Dr. Janet Travell in the 20th century, has emerged as a prominent technique in physical therapy for addressing musculoskeletal pain and dysfunction. This method involves the precise insertion of thin needles into trigger points or taut bands of muscle to alleviate tension, improve range of motion, and relieve pain. Dry needling has gained recognition as a non-pharmacological approach to pain management and functional restoration.



Data collection involved a multidimensional approach, incorporating electronic database searches and firsthand internship experiences. Three studies were selected to represent different injuries where dry needling could offer significant therapeutic benefits. These studies were chosen based on their relevance to understanding the efficacy and safety of dry needling in diverse populations and conditions, utilizing various treatment protocols and outcome measures.

Following my internship experience, I have gained inside information about dry needling and decided to choose three different injuries that Dry needling could be of great assistance to. These injuries include Upper Trapezius Trigger points,<sup>2</sup> Myofascial Temporomandibular Disorders<sup>1</sup> and tinnitus<sup>4</sup>. Between these three articles, we gain a broad perspective on three random diseases and injuries of populations that dry needling can benefit.

## FINDINGS

The findings from these studies revealed significant benefits associated with dry needling therapy.



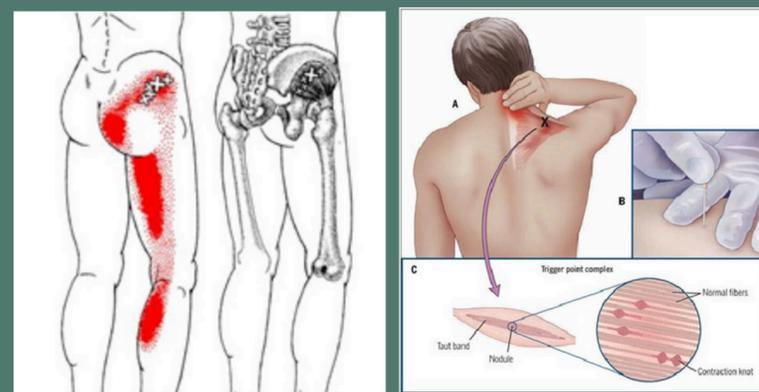
The Tinnitus study was recorded over time with a singular patient who has experienced tinnitus from traumatic car accidents. Over the course of weeks six, nine, and thirteen, the patient reported a steady decrease in pain and symptoms, with pain scores decreasing from 60/100 at baseline to 26/100, 24/100, and 4/100, respectively.<sup>4</sup>



In the Upper Trapezius study, they took 50 subjects divided into two groups, one group using dry needling and the other using cryotherapy. Significant improvements in range of motion were observed, with participants experiencing elongation of the muscle and restoration to full stretch length.<sup>2</sup>



Finally, the Temporomandibular study also included 50 subjects that all received 3 sessions of dry needling in a four-day span. While the Temporomandibular group initially showed no significant results, a reduction in pain was observed over time, indicating the potential for long-term therapeutic benefits with dry needling therapy.<sup>1</sup>



## CONCLUSION

- Dry needling therapy presents a promising avenue for managing musculoskeletal pain and dysfunction. The collective findings from various studies highlight its effectiveness in alleviating pain and enhancing range of motion in muscles and trigger points.
- Additionally, dry needling has demonstrated potential in improving tolerance to specific conditions such as tinnitus.
- While it's acknowledged that a single treatment may not fully resolve issues, dry needling emerges as a valuable manual therapy technique, proven to alleviate pain, increase range of motion, and offer relief for targeted diseases and diagnoses.

By precisely targeting trigger points and fostering tissue healing, dry needling effectively addresses pain, improves range of motion, and enhances muscle function. Its non-invasive nature and minimal side effects further solidify its role as a beneficial adjunctive therapy in both physical rehabilitation and pain management contexts.

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