

February 2023

Effect of Cupping Therapy on Muscle Tenderness in Collegiate Baseball Players Compared to Sham Treatment: A Randomized, Single-Blinded Trial

Andrew Cage

The University of Texas at Tyler, scage@uttyler.edu

Laurel Trail, MPA, LAT, ATC

The University of Texas at Tyler; UT Health East Texas, ltrail@uttyler.edu

Robert M. Galbraith

The University of Texas Health Science Center at Tyler; UT Health East Texas, robert.galbraith@uthct.edu

Carson Cox

The University of Texas at Tyler, ccox28@patriots.uttyler.edu

Brandon J. Warner

Grand Canyon University, brandon.warner@gcu.edu

Follow this and additional works at: <https://scholarworks.bgsu.edu/jsmahs>



Part of the [Rehabilitation and Therapy Commons](#), and the [Sports Medicine Commons](#)

How does access to this work benefit you? Let us know!

Recommended Citation

Cage, Andrew; Trail, MPA, LAT, ATC, Laurel; Galbraith, Robert M.; Cox, Carson; and Warner, Brandon J. (2023) "Effect of Cupping Therapy on Muscle Tenderness in Collegiate Baseball Players Compared to Sham Treatment: A Randomized, Single-Blinded Trial," *Journal of Sports Medicine and Allied Health Sciences: Official Journal of the Ohio Athletic Trainers Association*. Vol. 8: Iss. 4, Article 1.

DOI: <https://doi.org/10.25035/jsmahs.08.04.01>

Available at: <https://scholarworks.bgsu.edu/jsmahs/vol8/iss4/1>

This Article is brought to you for free and open access by the Journals at ScholarWorks@BGSU. It has been accepted for inclusion in Journal of Sports Medicine and Allied Health Sciences: Official Journal of the Ohio Athletic Trainers Association by an authorized editor of ScholarWorks@BGSU.

Effect of Cupping Therapy on Muscle Tenderness in Collegiate Baseball Players Compared to Sham Treatment: A Randomized, Single-Blinded Trial

S. Andrew Cage EdD, ATC, LAT, CES, PES, CCT[‡]; Laurel Trail MPA, LAT, ATC[‡]; R. Michael Galbraith DO, CCFP(SEM), Dip Sport Med[‡]; Carson Cox[‡]; Brandon J. Warner[‡]

[‡]The University of Texas at Tyler, [‡]The University of Texas at Tyler; UT Health East Texas, [‡]The University of Texas Health Science Center at Tyler; UT Health East Texas, [‡]Grand Canyon University

Purpose: The purpose of this study was to examine the effects of cupping therapy on muscular tenderness in the triceps surae of collegiate baseball players when compared to a control and sham treatment conditions. **Methods:** 20 collegiate baseball players (age= 22 ± 2 years, height= 186.8 ± 6.9 cm, weight= 88.6 ± 8.5 kg) participated in this study. Subjects were randomly assigned to either the treatment or sham treatment group. A mark was placed 10-cm superior to the musculotendinous junction of the Achilles tendon and the gastrocnemius on both legs. The treatment or sham treatment was then applied over the mark on the right leg for 15-minutes, with the left leg serving as a control. Muscle tenderness was measured in both legs with a handheld algometer at baseline and after treatment. An independent samples t-test was performed to determine differences in changes to muscle tenderness between the cupping therapy and sham cupping therapy groups. Paired samples t-tests were used to determine differences in changes to muscle tenderness between cupping therapy and sham cupping therapy groups and their respective controls. **Results:** A significant difference in reduction of muscle tenderness was found between the cupping therapy treatment group and the respective control group (treatment = 1.37 ± 0.54, treatment control = 0.5 ± 1.5, p = 0.009). A significant difference in reduction of tenderness was also noted between the cupping therapy treatment group, and the sham cupping therapy treatment group (treatment = 1.37 ± 0.54, sham = -0.37, p < 0.001). **Conclusion:** A single 15-minute cupping therapy treatment can decrease muscle tenderness at the triceps surae when compared to both a control and sham treatment condition. These findings are in keeping with previous studies, with the added benefit of attempting to control for a placebo effect and bias during statistical analysis.

Key Words: *cupping therapy, myofascial decompression, muscle tenderness, algometry*

INTRODUCTION

Cupping therapy is a therapeutic modality that has been documented as early as 3300 BC.¹ Utilizing negative pressure at the treatment site, clinicians using cupping therapy seek to increase blood flow, decrease pain, increase flexibility, and increase function.²⁻⁴ During the 2016 Olympics, cupping therapy began to grow in popularity as a treatment option in the United States of America and western Europe.¹ Some of this popularity may be because of increased media attention as a result of popular professional athletes being treated with cupping therapy as part of their medical care.^{5,6} Currently, there does not appear to be a consensus for treating either amateur or professional athletes with

cupping therapy despite the increase in use.¹ This lack of consensus is likely due to a lack of high-quality studies or standardized methodology.^{4,7} A clinical experts' statement has been published to provide some guidance to clinicians who wish to use cupping therapy, but there is still a need for well designed, rigorous studies.⁸

Previous research has shown that cupping therapy has a positive effect on local and regional blood flow.^{3,9,10} When cupping therapy is applied, the tissue in contact with the rim of the cup is compressed while negative pressure leads to the decompression of the tissues within the cup.¹¹ This decompression results in a pressure differential between the skin within the cup

and the underlying superficial blood vessels.¹¹ When this change in pressure occurs, the result is vasodilation, which leads to increased localized blood flow.¹¹ This increase in blood flow may be part of the mechanism resulting in decreased pain that has been shown in previous research.¹² Even so, there may be other mechanisms that result in pain modulation with cupping therapy. Previous research has also reported that while the body is healing the marks left by cupping therapy, macrophages are attracted to the treatment site.¹² This increase in macrophages combined with the release of the enzyme heme oxygenase-1 (HO-1) may create a better environment for healing.¹²

While cupping therapy has continued to grow in popularity, the need for more extensive research still exists. Particularly lacking is research on the effects of cupping therapy for competitive athletic populations.¹ Additionally, there appears to be little research on the effects of cupping therapy when compared to a sham intervention.^{13,14} Previous research has shown that cupping therapy is used by the majority of clinically practicing athletic trainers that were surveyed.¹⁵⁻¹⁷ This widespread use warrants further investigation into the effects of cupping therapy. Therefore, the purpose of this study was to assess the effects of cupping therapy on muscle tenderness of the triceps surae in collegiate baseball players when compared with sham and control groups.

METHODS

Participants

A total of 20 apparently healthy collegiate baseball players consented to and participated in this study as a convenience sample (age= 22 ± 2 years, height= 186.8 ± 6.9 cm, weight= 88.6 ± 8.5 kg). All participants were informed of the study's purpose, and informed consent was obtained. Participants were then randomly assigned to the treatment group or the sham group using a random number generator.

Cupping Therapy

To ensure continuity, all cupping therapy treatments were performed by the same clinician. In all subjects, the right leg was used as the treatment leg, as this was the leg each subject identified as their dominant leg. Before applying cupping therapy, a mark was made with a dry erase marker 10-cm superior to the musculotendinous junction of the Achilles tendon and the gastrocnemius muscle on both legs. Participants were then instructed to remain laying prone and not look behind them for the duration of the study. After baseline tenderness measures were taken on both calves, coconut oil was applied to the participant's right leg around the area of the mark. Coconut oil was chosen based off the relatively low risk of allergic reaction, and availability in the clinic where data were being collected. A plastic cup (Khangzhu Vacuum Cup, Beijing Kangda World Medical Appliance Center, Beijing, China) was placed on a pump before being placed over the mark on the patient's gastrocnemius. Two pumps of air were removed from the cup, and the pump was removed (Figure 1). The number of pumps chosen was based off of clinical techniques and previously conducted studies.^{2,3,9} The cup was left in place for 15-minutes, which was in keeping with the methodology of previous studies.^{3,9} When the cup was removed, tenderness measures were taken again. Following completion of the treatment and measures, the gastrocnemius was cleaned with a terry cloth towel. No participants reported any adverse effects such as soreness or loss of motion from the cupping therapy treatment.



Figure 1. Cupping therapy over the gastrocnemius

Sham Cupping Therapy

Before applying the sham cupping therapy, a mark was made with a dry erase marker 10-cm superior to the musculotendinous junction of the Achilles tendon and the gastrocnemius muscle on both legs. Participants were then instructed to remain laying prone and not look behind them for the duration of the study. After baseline tenderness measures were taken on both calves, the researcher opened and closed the jar of coconut oil and then mimicked applying coconut oil to the participant's right leg around the area of the mark without actually applying coconut oil. A plastic cup (Khangzhu Vacuum Cup, Beijing Kangda World Medical Appliance Center, Beijing, China) with a small hole drilled in the cup and double-sided tape placed around the rim was then placed on a pump before being placed over the mark of the patient's gastrocnemius. Two pumps of air were removed from the cup, although no suction was achieved, and the pump was removed (Figure 2). The cup was left in place for 15-minutes, mirroring the treatment group. When the cup was removed, tenderness

measures were taken again. Following completion of the sham treatment and measures, the gastrocnemius was cleaned with a terry cloth towel. No participants reported any adverse effects from the sham cupping therapy treatment.



Figure 2. Sham cupping therapy over the gastrocnemius

Muscle Tenderness

Tissue algometry has been established as a valid method of measuring muscle tenderness in previous studies.¹⁸ Previous studies have used an average of three measures of tissue algometry to ensure reliability.¹⁸ Muscle tenderness measures were taken over the mark placed on the gastrocnemius of both legs using a handheld pressure algometer (Baseline Push Pull Force Gauge, Fabrication Enterprises, Inc., White Plains, New York) (Figure 3). Measurements were taken at baseline and following the treatment or sham treatment. During the intervention or sham treatment, the left leg was left in an extended position for the same duration as the treatment time in order to serve as the control limb. At both times, measures were taken

three times so an average could be obtained using SPSS V28 (IBM, Armonk, NY).

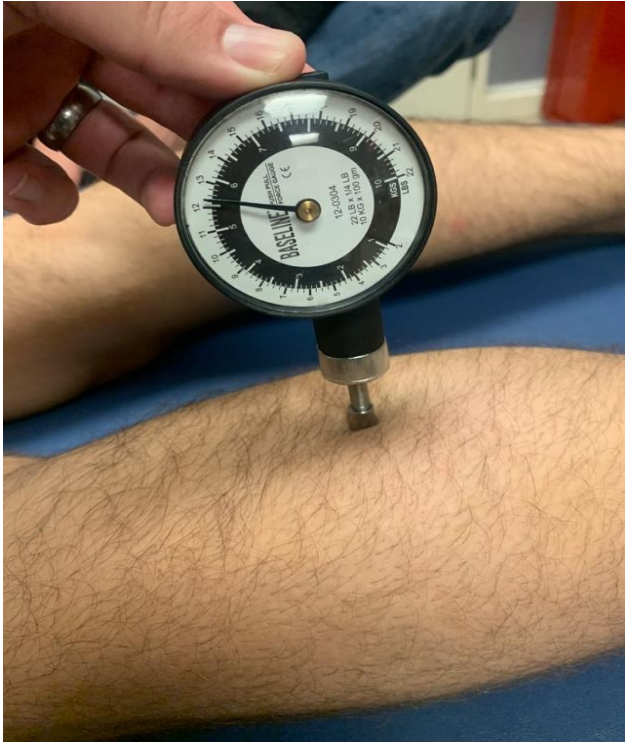


Figure 3. Handheld algometry on the gastrocnemius

Statistical Analysis

Prior to analysis, all condition group names were deidentified and replaced with numbers to allow a member of the research team to conduct statistical analysis blinded. The sham group and their respective control measures were labeled “Group 1”, and the intervention group and their respective control measures were labeled “Group 2”. Means and standard deviations were calculated in order to describe demographic information about the participants. An independent samples t-test was performed to determine differences in changes to muscle sensitivity between the cupping therapy and sham cupping therapy groups. Paired samples t-tests were used to determine differences in changes to muscle sensitivity between the cupping therapy and sham cupping therapy groups and their respective control limbs. Significance was set at an alpha level of $p < 0.05$. Statistical analysis was performed using SPSS V28.

RESULTS

The cupping therapy treatment group showed a significant decrease in muscle tenderness when compared to the respective control group (treatment = 1.37 ± 0.54 lbs, treatment control = 0.5 ± 1.5 lbs, $p = 0.009$). The sham cupping therapy treatment group did not show a significant decrease in muscle tenderness when compared to the respective control group (sham = -0.37 ± 0.73 lbs, sham control = 0.60 ± 1.07 lbs, $p = 0.416$). When compared to one another, the cupping therapy treatment group showed a significant decrease in muscle tenderness when compared to the sham cupping therapy treatment group (treatment = 1.37 ± 0.54 lbs, sham = -0.37 , $p < 0.001$).

DISCUSSION

The purpose of this study was to determine if cupping therapy would decrease muscle tenderness in collegiate baseball players when compared to a sham cupping therapy treatment. While previous studies have shown that cupping therapy has positive effects regarding pain modulation, there have apparently been few studies that have compared changes in musculoskeletal pain following cupping therapy to a sham intervention.^{13,14} Results from the current study indicate that a 15-minute cupping therapy treatment does decrease muscle tenderness in the triceps surae relative to the control limb when compared to a sham cupping therapy treatment. This decrease suggests that cupping therapy can be an effective treatment option for treating muscular tenderness.

Currently, the exact mechanisms by which cupping therapy decrease musculoskeletal pain are not entirely understood. It has been suggested that the compression of the rim of the cup and decompression may provide sensory feedback that leads to pain modulation.¹² The increase in localized blood flow brought on by cupping therapy may play a role in decreasing pain as well.^{9,12} While it is possible that these two mechanisms overlap

to achieve pain relief, there do not appear to be any published studies examining the exact effects of cupping therapy on pain modulation.

The findings of the current study suggest that there is a decrease in muscle tenderness in the triceps surae after a single cupping therapy treatment. In this study, muscle tenderness significantly decreased in the cupping therapy treatment group when compared to both a control, and sham cupping therapy treatment group. These results support previous findings that indicate cupping therapy decreases musculoskeletal pain.¹⁰

LIMITATIONS

One limitation of this study was the sample size selected. Since the sampling was a convenience sampling based off of available collegiate baseball players, the sample size may not have been large enough to completely answer the research question. Future studies should use a larger sample of competitive athletes to ensure that statistical power has been achieved. Given that this study was conducted using a convenience sample, data regarding whether subjects had previously received cupping therapy was not collected. Future studies should assess the affect of previous experience with cupping therapy related to clinical outcomes. Another possible limitation of this study of this study was that the same subjects served as subjects in both the intervention and control groups. Given evidence that cupping therapy may promote systemic relaxation and pain relief, the control limb may have also been affected. Future studies should include a separate group of subjects to serve as the control group.

FUTURE RESEARCH

There is a need for future research to examine other clinical outcomes of cupping therapy when compared to a sham treatment. These outcomes include range of motion, perceived level of function, and localized blood flow. Future research should also be conducted to assess the potential physiological mechanisms behind the reported decreases in

muscle tenderness and musculoskeletal pain. Such research has the potential to provide information regarding how best to achieve pain relief via cupping therapy.

CONCLUSIONS

In conclusion, a single 15-minute cupping therapy treatment has the potential to decrease muscle tenderness at the triceps surae when compared to both a control and sham treatment condition. These findings are in keeping with previous studies, with the added benefit of attempting to control for a placebo effect and bias during statistical analysis. The results of this study may assist clinicians in determining appropriate parameters for applying cupping therapy when seeking to achieve decreases in muscular pain and tenderness.

REFERENCES

1. Bridgett R, Mas D, Prac C, Klose P, Duffield R, Mydock S, Lauche R. Effects of cupping therapy in amateur and professional athletes: Systematic review of randomized controlled trials. *The Journal of Alternative and Complementary Medicine*. 2018;24(3):2018-219. doi: 10.1089/acm.2017.0191
2. Cage SA, Warner BJ, Gallegos DM, Sims-Koenig K. Effects of cupping therapy on Lower Quarter Y-Balance Test scores in collegiate baseball players. *Research & Investigation in Sports Medicine*. 2020;6(1): 466-468. doi: 10.31031/RISM.2020.06.000627
3. Arce-Esquivel A, Warner B, Gallegos D, Cage SA. Effect of dry cupping therapy on vascular function among young individuals. *International Journal of Health Sciences*. 2017;5(3):10-15. doi: 10.15640/ijhs.v5n3a2
4. Cao H, Li X, Yan X, Wang N, Bensoussan A, Liu J. Cupping therapy for acute and chronic pain management: A systematic review. *Journal of Traditional Chinese Medical Sciences*. 2014;2:49-61. doi: 10.1016/j.jtcms.2014.11.003
5. Futterman M. Michael Phelps leads Rio cupping craze. *The Wall Street Journal*. August 8, 2016.
6. Lyons K. Interest in cupping therapy spikes after Michael Phelps gold win. *The Guardian*. August 9, 2016
7. Cao H, Li X, Liu J. An updated review of the efficacy of cupping therapy. *PLoS ONE*. 2012;7(2). doi: 10.1371/journal.pone.0031793

8. Cage SA, Gallegos DM, Coulombe, Warner BJ. Clinical experts statement: The definition, prescription, and application of cupping therapy. *Clinical Practice in Athletic Training*. 2019;2(2):4-11. doi: 10.31622/2019/0002.2
9. Cage SA, Warner BJ, Gallegos DM. Effect of cupping therapy on skin surface temperature in healthy individuals. *Journal of Sports Medicine and Allied Health Sciences*. 2016;5(3). doi: 10.25035/jsmahs.05.03.02
10. Chi L, Lin L, Chen C, Wang S, Lai H, Peng T. The effectiveness of cupping therapy on relieving chronic neck and shoulder pain: A randomized controlled trial. *Evidence-Based Complementary and Alternative Medicine*. 2016. doi: 10.1155/2016/7358918
11. Liu W, Piao S, Meng X, Wei L. Effects of cupping on blood flow under the skin of back in healthy human. *World Journal of Acupuncture-Moxibustion*. 2013;23(3):50-52. doi: 10.1016/S1003-5257(13)60061-6
12. Lowe D. Cupping therapy: An analysis of the effects of suction on the skin and possible influence on human health. *Complimentary Therapies in Clinical Practice*. 2017;29:162-168. doi: 10.1016/j.ctcp.2017.09.008
13. Silva HJ, Saragiotto BT, Silva RS, Lins CA, Souza MC. Dry cupping in the treatment of individuals with non-specific chronic low back pain: A protocol for a placebo-controlled, randomised, double-blind study. *BMJ*. 2019;9(12):e032416. doi: 10.1136/bmjopen-2019-032416. doi: 10.1136/bmjopen-2019-032416
14. Silva HJ, Barbosa GM, Silva RS, Saragiotto BT, Oliviera JP, Pinheiro YT, Lins CA, Souza MC. Dry cupping therapy is not superior to sham cupping to improve clinical outcomes in people with non-specific chronic low back pain: A randomised trial. *Journal of Physiotherapy*. 2021;67(2):132-139. doi: 10.1016/j.jphys.2021.02.013.
15. Cage SA, Warner BJ, Gallegos DM, Winkelmann ZK. Athletic trainers' perceived and actual knowledge of cupping therapy concepts. *Journal of Sports Medicine and Allied Health Sciences*. 2020;5(3). doi: 10.25035/jsmahs.05.03.06
16. Cage SA, Winkelmann ZK, Warner BJ, Gallegos DM. Perceived and actual knowledge of cupping therapy concepts among athletic training preceptors in CAATE accredited programs. *Research & Investigations in Sports Medicine*. 2020;6(3):514-518. doi: 10.31031/RISM.2020.06.000638
17. Cage SA, Warner BJ, Gallegos DM, Goza JP, Winkelmann ZK. Perceived and Actual knowledge of cupping therapy concepts among athletic trainers in the state of Texas. *Research & Investigations in Sports Medicine*. 2020;6(4):538-542. doi: 10.31031/RISM.2020.06.000644
18. Warner BJ, Gallegos DM, Oliver CB, Trail LE, Cage SA. The Effects of Tissue Flossing on Muscular Tenderness in Collegiate Baseball Players. *Journal of Athletic Training*. 2020;55(6S):S-110.