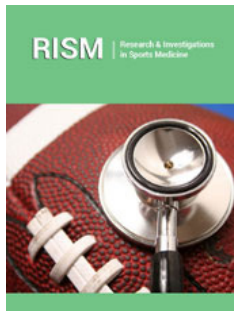


# Effect of Silicone Cupping Therapy Combined with Throwing on Muscular Tenderness in Collegiate Baseball Pitchers

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## Abstract

Cupping therapy is an ancient therapeutic modality that uses suction to create a decompression effect on the targeted tissue. This negative pressure causes potential therapeutic effects including decreased musculoskeletal pain, increased regional, and localized blood flow. While there is not a consensus on the prescription and application of cupping therapy, the modality continues to grow in popularity in the sports medicine setting. One method of cupping therapy involves the use of flexible silicone cups. These cups allow patients to move the body part receiving treatment and perform therapeutic exercise. To date, there has not appeared to be any studies that examined the efficacy of using silicone cups with therapeutic exercise. Therefore, the purpose of this retrospective pilot study was to assess the effects of light throwing with silicone cups applied on muscular tenderness in collegiate baseball pitchers. Review of medical records found that 18 male baseball pitchers (age 21±1 year; height 197.36±4.57cm; weight 90.72±6.65kg) had undergone evaluation and treatment that yielded includable data. Pitchers underwent the prescribed treatment if they threw 30 or more pitches in a game or competitive practice the previous day. The treatment site was prepared using coconut oil to allow the silicone cups to adhere better to the pitcher's skin. Silicone cups were then applied to the rhomboids, upper trapezius, supraspinatus, posterior humeral head, latissimus dorsi, and bicipital groove. Pitchers were then instructed to throw a baseball with as little intent as possible for five minutes. Upon completion of throwing, the cups were left in place for an additional fifteen minutes, at which point the cups were removed. Paired samples t-tests were run to assess differences before and after treatment in muscular tenderness. Muscular tenderness significantly decreased at all treatment sites following treatment ( $p < .001$ ). These findings suggest that the combination of silicone cupping therapy and light throwing has the potential to decrease muscular soreness 24 hours after pitching. Future research should attempt to gather data on larger sample sizes and attempt to determine the mechanisms by which cupping therapy decreases muscular tenderness and soreness.

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## Introduction

Cupping therapy is a therapeutic modality that has been used for millennia [1]. The therapeutic goal of cupping therapy is to create negative pressure at the treatment site for the goal of increasing blood flow, decreasing pain, increasing flexibility, and increasing function [2-5]. During the 2016 Olympics, cupping therapy received mainstream media exposure leading to an increase in popularity in the United States and Western Europe [1]. Specifically, the use of cupping therapy by elite level athletes such as Michael Phelps receiving this treatment increased the exposure for cupping therapy [6,7]. To date, there has been no consensus on a standardized methodology for selection of cupping therapy as a treatment technique, cupping therapy has continued to be used increasingly in allied healthcare settings [1]. This lack of consensus is due in part to a lack of high-quality randomized controlled trials and no agreed-upon standardized methodology [4,8]. In the absence of such a consensus statement, a clinical expert's statement was published in 2019 in an attempt to provide guidance to practitioners

using cupping therapy until better evidence became available. In this statement, the authors noted the need for more well-designed, rigorous studies on the use and efficacy of cupping therapy [9]. The positive effect of cupping therapy on regional and local blood flow has become increasingly well documented in recent years [3,4,10]. Applying a cup to a treatment site is done with the goal of subjecting the underlying tissue to negative pressure that leads to compression of the tissue in contact with the rim of the cup and decompression of the tissue inside the cup. This lower pressure within the cup may cause a pressure differential between the skin within the cup and the underlying superficial capillaries [10]. This change in pressure may cause vasodilation, which results in localized increase in blood flow [10].

This increased blood flow has been suggested as a potential mechanism for the decreases in pain documented in previous research [11]. Currently, there does not appear to be a proposed mechanism for the positive effect on regional blood flow that has been demonstrated in earlier studies. The ability of cupping therapy to decrease musculoskeletal pain has been shown in several studies [12-14]. These studies primarily focused on patient reported outcomes and did not attempt to determine the underlying mechanism by which cupping therapy can decrease pain. One suggested mechanism is that as the marks left on the tissue following treatment are healing, macrophages are attracted to the treated area [11]. Additionally, it has been proposed that cupping therapy results in a localized increase in the enzyme heme oxygenase-1 (HO-1) [11]. As the body utilizes HO-1, the bi-products include heme, biliverdin, bilirubin, carbon monoxide, and iron. As this process occurs, iron is sequestered by ferritin, and the remaining bi-products produce antioxidant, anti-inflammatory, and neuro modulatory effects that create an optimal environment for healing [11]. Optimized healing may then lead to pain reduction [11]. As cupping therapy has continued to grow in popularity, clinicians have explored different methods of incorporating the modality into treatment and rehabilitation protocols. Cupping therapy devices may be made of different materials including glass, wood, plastic, and silicone [14]. Silicone cups provide several unique advantages compared to cups made from other materials. Specifically, silicone cups have a more flexible rim that allows cups to be placed on tissues that may have an irregular surface. This flexibility also allows for movement to be more comfortable while the cups are attached to the treatment site. The flexibility of the rim also allows for the possibility of performing therapeutic exercises while cups are applied. However, there do not appear to be any studies examining the efficacy of therapeutic exercise in conjunction with treatment using silicone cups. Therefore, the purpose of this retrospective pilot study was to examine the effect of performing recovery throwing with silicone cups attached on muscular tenderness in collegiate baseball players.

## Methods

### Design

This study was conducted using a retrospective analysis of

data collected via regular medical documentation associated with evaluation and treatment of collegiate baseball pitchers at an NCAA Division II institution.

### Participants

Prior to identifying subjects, exemption was granted by The University of Texas at Tyler Institutional Review Board. Subjects were identified for this study by reviewing medical documentation that was regularly conducted by the treating athletic trainer. The documentation included tissue algometer measures intended to ensure that muscular tenderness had decreased. Muscular tenderness measurements were taken before and after the intervention, a digital handheld algometer (SF-500 Digital Force Pressure Gauge, Beslands, Jiaxing, Zhejiang, China). A total of 18 male baseball pitchers (age  $21 \pm 1$  year; height  $197.36 \pm 4.57$ cm; weight  $90.72 \pm 6.65$ kg) had undergone evaluation and treatment that yielded includable data.

### Data collection

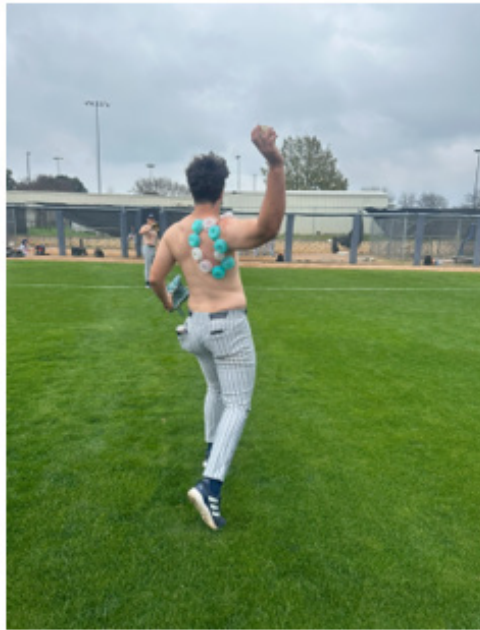
Pitchers underwent the prescribed treatment if they threw 30 or more pitches in a game or competitive practice the previous day. The treatment site was prepared using coconut oil to allow the silicone cups to adhere better to the pitcher's skin. Silicone cups were then applied to the skin overlaying the rhomboids, upper trapezius, supraspinatus, posterior humeral head, latissimus dorsi, and bicipital groove (Figure 1&2). Pitchers were then instructed to throw a baseball with as little intent as possible for five minutes. Upon completion of throwing, the cups were left in place for an additional 15 minutes, at which point the cups were removed. Prior to the treatment being applied, muscular tenderness was measured at the supraspinatus, upper trapezius, and long head of the biceps tendon. These measurement sites were chosen due to frequencies of patient reported soreness following pitching. Following the removal of the silicone cups, measurements were taken again. Throughout the remaining time leading to the next pitching appearance, each pitcher participated in individualized practice, strength and conditioning training, treatment, and rehabilitation based on their specific needs. No pitchers reported adverse reactions to the treatment protocol.

### Statistical analysis

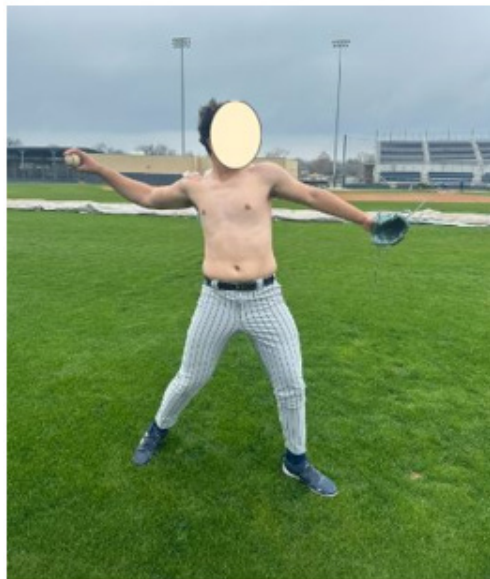
Pertinent information from pitcher medical records was transposed to and analyzed using a commercially available statistics software package (SPSS Version 28, IBM, Armonk, NY). A total of 18 records were included in the data analysis. Means and standard deviations were calculated where appropriate. A paired samples t-test was performed to assess differences before and after silicone cupping with throwing for muscular tenderness. Significance was set at  $p < 0.05$  a priori.

### Result

In all pitchers included in this retrospective pilot study, significant improvement was found for muscular tenderness for all three muscles tested. Results are displayed in Table 1.



**Figure 1:**



**Figure 2:**

**Table 1:**

Measurement	Supraspinatus	Upper Trapezius	Long Head of Biceps
Muscular Tenderness (N)	41.2±10.1 to 50.1±8.7*	39.9±6.1 to 47.0±6.8*	42.0±7.6 to 50.0±7.3*

\*p < .001.

**Discussion**

The purpose of this study was to assess the effectiveness of throwing with silicone cups applied for decreasing muscular tenderness. Previous research has identified the effectiveness of cupping therapy for decreasing muscular tenderness [13,14].

Despite a growing body of literature supporting the use of cupping therapy, available studies appear to use cupping in a static manner rather than dynamic. To the authors’ knowledge, this is the first study to examine the effects of using silicone cupping to perform treatment during movement. A possible limitation of this study was a relatively small sample size. Given that this study was conducted

using medical records for pitchers currently competing for a single NCAA institution, it would have been difficult to involve a larger number of patients. While this study demonstrated promising results for decreasing muscular tenderness using a combination of cupping and throwing, the scope of the research did not examine the mechanisms that led to these results. Determining these mechanisms would likely involve more invasive procedures including venipuncture to analyze serum markers associated with these effects. As this was a retrospective pilot study, acquiring this data would not have been feasible. Lastly, the nature of this study did not allow for a control group to be used.

Future research should be conducted in a prospective manner to allow for improvements on the current study. A prospective, controlled study would allow for the targeted recruitment of more subjects. Additionally, future research should attempt to examine the mechanisms by which cupping therapy improves blood flow and decreases muscular tenderness. This information will be valuable for guiding future studies, as well as clinical application of silicone cupping therapy in conjunction with movement. To the authors' knowledge, this is the first study conducted to assess the effects of silicone cupping therapy with throwing on muscular tenderness. The combination of cupping therapy and light throwing led to a decrease in muscular tenderness. Future research should look further into the mechanisms of cupping therapy that lead to decreased muscular tenderness. Provided these studies use sound and standardized methodology, a more conclusive statement may be able to be made on the effect of silicone cupping therapy with exercise for improving patient rated outcomes.

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