

THE EFFECTS OF BOXING GLOVE SIZE ON THUMB POSITION WHEN MAKING A FIST FOR STRIKING

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ABSTRACT

Damage commonly occurs at the MP (metacarpophalangeal) and CMC (carpometacarpal) joints of the thumb when boxing. Previous research demonstrated that boxing glove design alters thumb position in relation to a 10 oz glove. When making a fist in a boxing glove the thumb is abducted away from the hand placing it in a more vulnerable position. The effect of glove size on thumb position has yet to be examined in the literature. **PURPOSE:** The purpose of this study was to determine the effects of boxing glove size on thumb joint angles when making a fist for striking. **METHODS:** Ten experienced fighters (7.4 ± 3.9 years of training) volunteered to participate in this study (Males = 5 and Females = 5). A DEXA scan was used to produce an x-ray image of the thumb position for all conditions (no glove, 10 oz, 12 oz, 14 oz, and 16 oz). Subjects placed their hand dorsal side down on the DEXA and held a fist throughout the scan. Joint angles were measured on the resulting x-ray images. Means for dependent measures (CMC, IP (interphalangeal) and MP joint angles and perpendicular distance from the 2nd metacarpal of the hand to the center of the MP joint) were compared using repeated measures ANOVA and an alpha of 0.05. **RESULTS:** The CMC joint angle was significantly different between no glove ($14.1 \pm 6.54^\circ$) and 10 oz ($34.2 \pm 7.60^\circ$), 12 oz ($36.30 \pm 9.57^\circ$), 14 oz ($38.60 \pm 9.67^\circ$) and 16 oz ($37.80 \pm 10.25^\circ$) at $p \leq .001$. The MP joint angle was significantly different between no glove ($132.6 \pm 12.74^\circ$) and 10 oz ($149.40 \pm 8.15^\circ$) at $p \leq .001$, 12 oz ($148.5 \pm 9.17^\circ$) at $p = .002$, 14 oz ($147.70 \pm 8.91^\circ$) at $p = .003$ and 16 oz ($145.90 \pm 11.12^\circ$) at $p = .017$. There were no significant differences in IP joint angle between no glove and all conditions. The perpendicular distance was significantly different between no glove ($.48 \pm .54$ cm) and 10 oz ($1.84 \pm .29$ cm), 12 oz ($1.95 \pm .47$ cm), 14 oz ($2.02 \pm .39$ cm), and 16 oz ($1.95 \pm .37$ cm) at $p \leq .001$. The CMC joint angle was significantly different between 10 oz ($34.2 \pm 7.60^\circ$) and 14 oz ($38.60 \pm 9.67^\circ$) at $p = .013$. No other differences were found in the CMC joint between any size glove. No significant differences were found in the MP joint across glove sizes. No significant differences were found in the IP joint across glove sizes. No significant differences were found in the perpendicular distance across glove sizes. **CONCLUSIONS:** When forming a fist without a glove, the thumb is flexed and adducted below the fingers for protection. When making a fist with a boxing glove, the thumb is abducted away from the hand which increases CMC and MP joint angles placing the thumb at greater risk of injury. All four glove sizes (10 oz, 12 oz, 14 oz, and 16 oz) were found to be significantly different in relation to the no glove condition. With the exception of the CMC joint angle between the 10 oz and 14 oz glove, there were no significant differences found in thumb position between the four glove sizes compared in this study. Thumb position does not appear to be altered across boxing glove sizes. **PRACTICAL APPLICATIONS:** Findings from this study provide descriptive information on thumb position between a fist made without a glove and across four different sized boxing gloves. Information collected in this study could be used to further boxing glove design.

INTRODUCTION

- During combat sports the hand is often injured. Damage to the MP (metacarpophalangeal) and CMC (carpometacarpal) joints of the thumb are the most common reported hand injuries in striking sports. Previous research has shown that boxing glove design alters thumb joint angles possibly placing the thumb in a position that could increase the risk of injury. The effect of glove size on thumb position has yet to be examined in the literature.

PURPOSE

- The purpose of this study was to determine the effects of boxing glove size on thumb joint angles when making a fist for striking.

METHODS

Subjects

- Ten experienced fighters (7.4 ± 3.9 years of training) participated in this study (Males = 5 and Females = 5)

Lab Protocol

- A DEXA scan was used to produce an x-ray image of thumb position for all conditions (no glove, 10 oz, 12 oz, 14 oz, and 16 oz).
- Subjects were asked to place their hands dorsal side down on the DEXA, then make a fist and hold position throughout the DEXA scan.
- Joint angles were then measured on the resulting x-ray images.
 - Interphalangeal (IP) Joint
 - Metacarpophalangeal (MP) joint
 - Carpometacarpal (CMC) joint
- The perpendicular distance from the 2nd metacarpal of the hand to the center of the MP joint was measured.
 - Measurement scale was determined by metal calibration block placed within the scanning area.
- Both angle measurements and perpendicular measurements were taken multiple times to ensure accuracy.

Statistical Analysis

- Means for dependent measures (CMC, IP (interphalangeal) and MP joint angles and perpendicular distance from the 2nd metacarpal of the hand to the center of the MP joint) were compared using repeated measures ANOVA and an alpha of 0.05.

RESULTS

- The CMC joint angle was significantly different between no glove ($14.1 \pm 6.54^\circ$) and 10 oz ($34.2 \pm 7.60^\circ$), 12 oz ($36.30 \pm 9.57^\circ$), 14 oz ($38.60 \pm 9.67^\circ$) and 16 oz ($37.80 \pm 10.25^\circ$) at $p \leq .001$.

- The MP joint angle was significantly different between no glove ($132.6 \pm 12.74^\circ$) and 10 oz ($149.40 \pm 8.15^\circ$) at $p \leq .001$, 12 oz ($148.5 \pm 9.17^\circ$) at $p = .002$, 14 oz ($147.70 \pm 8.91^\circ$) at $p = .003$ and 16 oz ($145.90 \pm 11.12^\circ$) at $p = .017$.

- There were no significant differences in IP joint angle between no glove and all conditions. The perpendicular distance was significantly different between no glove ($.48 \pm .54$ cm) and 10 oz ($1.84 \pm .29$ cm), 12 oz ($1.95 \pm .47$ cm), 14 oz ($2.02 \pm .39$ cm), and 16 oz ($1.95 \pm .37$ cm) at $p \leq .001$.

- The CMC joint angle was significantly different between 10 oz ($34.2 \pm 7.60^\circ$) and 14 oz ($38.60 \pm 9.67^\circ$) at $p = .013$.

- No other differences were found in the CMC joint between any size glove. No significant differences were found in the MP joint across glove sizes. No significant differences were found in the IP joint across glove sizes. No significant differences were found in the perpendicular distance across glove sizes.

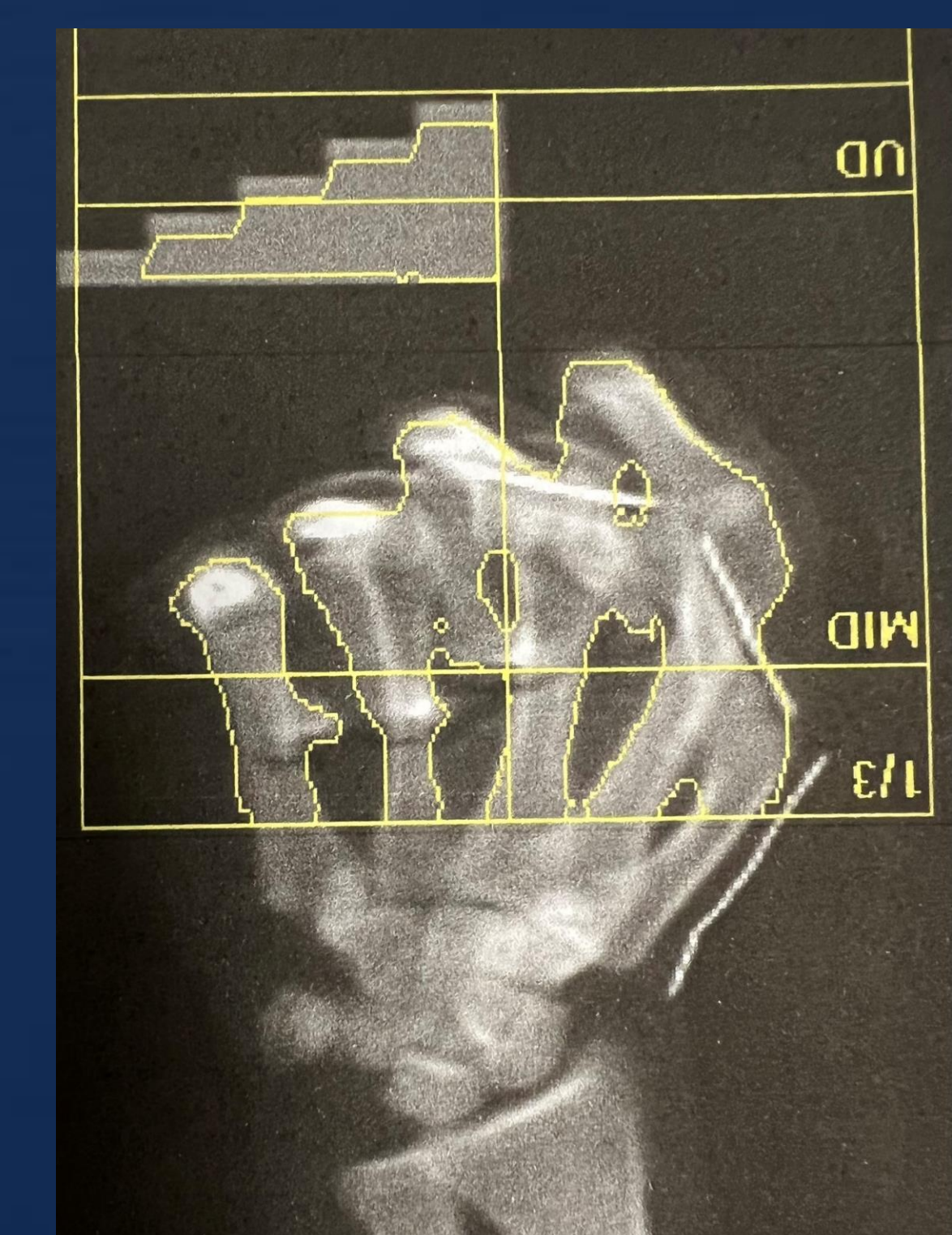
CONCLUSION

When forming a fist without a glove, the thumb is flexed and adducted below the fingers for protection. When making a fist with a boxing glove, the thumb is abducted away from the hand which increases CMC and MP joint angles placing the thumb at greater risk of injury. All four glove sizes (10 oz, 12 oz, 14 oz, and 16 oz) were found to be significantly different in relation to the no glove condition. With the exception of the CMC joint angle between the 10 oz and 14 oz glove, there were no significant differences found in thumb position between the four glove sizes compared in this study. While thumb position is altered from the no glove situation, the thumb position does not appear to be significantly altered across boxing glove sizes.

Practical Applications

Findings from this study provide descriptive information on thumb position between a fist made without a glove and across four different sized boxing gloves. Information collected in this study could be used to further boxing glove.

No Glove



Glove

