THE EFFECT OF USE OF TWO WRIST ORTHESIS STYLES ON HAND FUNCTION

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INTRODUCTION
Wrist is an intricate mechanism between the hand and forearm that allows the positioning of the fingers and promotes stability for the hand function [1]. Some conditions affect the wrist movement and position, thus, affect the hand function. Wrist extensor orthosis are frequently indicated to prevent deformities, relieve pain during inflammation, stabilize or immobilize the wrist, protect against injury, promote healing and assist the function [2]. Despite the wrist orthosis are designed to promote enhance current hand function during functional tasks, little researches have been done on the effect that orthosis has on hand function [3,4].

Low temperature thermoplastics are the most efficient material for orthosis manufacturing due to their easy manipulation and good mechanical properties [1]. However, successive heating can cause reduction of its mechanical properties up to 25% of original ones, promoting a premature fracture [5]. Even though, this material is expensive for usage in public health service. Hybrid composites materials are an interesting option to manufacturing orthosis. These materials are composed of a blending of two or more organic materials in which one is used as matrix and the other as reinforcement [6]. Van Petten e Ávila [7] presented a new Hybrid composite materials to orthosis manufacture. This material has good mechanical properties and easy mold ability. Moreover, new composites costs are at least 60% less than conventional thermoplastics and are thickness, being useful in orthotic manufacturing.

The current study means to investigate the effects of two styles of static wrist orthosis, an Ézeform orthosis and a Hybrid Composite Orthosis on hand function, determining whether the immobilization of the wrist in fact, interfered on functional performance.

METHODS
Twenty-six volunteers took part of this research, 73% women and 27% men. The average age was 20.46 years, and the average weight was 63.92 kg (≈ 143.64 pounds). None of the volunteers suffered any pain or were under medication during the two weeks previous to the test. Ézeform and Hybrid Composite Orthosis (Figure 1) were made for the dominant hand of each volunteer. The orthosis immobilized the wrist in 15° of extension.

The Jebsen Taylor Hand Function Test (J-T) was used to assess the hand function. This test was designed to assess the effective use of the hand in everyday activity by performing several tasks (writing, flipping cards, picking up small objects, simulated feeding, pile up blocks, picking up light weight objects and picking up light weight objects) that are representative of function manual activities [8].

The volunteers performed the J-T test under three conditions: free hand, wearing a composite orthosis (Hybrid-C), and wearing a Ézeform orthosis. The results obtained in the three conditions were compared. To be able to evaluate the data statistical significance, the Wilcoxon test was performed (p<0.05).

RESULTS AND DISCUSSION
Figure 2 shows the time measured during the Jebsen-Taylor test. Table 2 shows Wilcoxon test. Immobilized conditions resulted in significant increase in time to perform all activities (p=0.0), consistent with Carlson and Trombly’s [3] results.
The wrist immobilization by Ezeform end Experimental orthosis decrease movement arch of this joint and could limit finger flexor tendon functional excursion, restricting hand positioning and increasing the time to perform the test [3,9].

The subjects of this study had neither motor deficits and had no time for full adjustment to the new device. This fact can be another factor interfering on hand function when using wrist extensor orthosis. Splinting may create a control parameter that affects motor behavior, so, it may cause a shift from on patter of movement to another, less efficient [4].

Orthesis material can affect hand function. The Hybrid-C orthosis mean time to complete all activities was faster than Ezeform orthosis condition. Significant difference (p= 0.01 was found in Feeding, Picking up large light objects and Picking up large heavy objects subtests. Ezeform orthesis are more restrictive than Hybrid-C orthosis, that has an elastic coating. Elastic coating of Hybrid-C orthosis could allowed more comfort, better fit to body segment, carpometacarpal thumb joint opposition and grasping, reducing the time to perform activities.

CONCLUSIONS
The present study investigated the effects of two styles of static wrist othoses, a Ezeform orthosis and a Hybrid Composite Orthosis on hand function. Both orthosis interfered with hand function, increasing the time to perform all activities of Jebsen Taylor Hand Function. The Hybrid-C orthesis interfered less with the function and should be suggested when dexterous use of the hand are the required movements for the vocational or functional tasks, while Ezeform orthesis should be suggested when simple grasp and release of large objects are the main required movements.

Table 1: Wilcoxon Test of the Free Hand condition versus Ezeform and versus Hybrid-C conditions and of Ezeform condition versus Hybrid-C condition

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Free Hand x Ezeform</th>
<th>Free Hand x Hybrid-C</th>
<th>Ezeform x Hybrid-C</th>
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<tbody>
<tr>
<td></td>
<td>Mean difference</td>
<td>p value</td>
<td>Mean difference</td>
</tr>
<tr>
<td>Writing (sec)</td>
<td>-2.65</td>
<td>0.000*</td>
<td>-2.09</td>
</tr>
<tr>
<td>Turning over cards</td>
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<td>-2.57</td>
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<tr>
<td>(sec)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picking up small objects</td>
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<td>0.000*</td>
<td>-2.43</td>
</tr>
<tr>
<td>(sec)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>0.000*</td>
<td>-1.99</td>
</tr>
<tr>
<td>Stacking chekers (sec)</td>
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<td>0.000*</td>
<td>-1.43</td>
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<tr>
<td>Picking up large light</td>
<td>-1.89</td>
<td>0.000*</td>
<td>-1.09</td>
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<tr>
<td>objects (sec)</td>
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<td></td>
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<tr>
<td>Picking up large heavy</td>
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<td>0.000*</td>
<td>-1.18</td>
</tr>
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<td>objects (sec)</td>
<td></td>
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</table>

*Significative difference (p<0.05)

ACKNOWLEDGEMENTS
The authors would like to acknowledge the Brazilian Research Council (CNPq) grants 470511/2006-0, 300826/2005-2 and 550067/2005-1 for their financial support.

REFERENCES