# The Effect of Athletic performance by Wearing Mouthguard

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**Abstract**

We conducted experiments to determine whether the use of mouth guards has any effect on competitive performance. Our results are divided into three categories:

1) athletes who do not regularly use mouthguards and who are compelled to perform with them are negatively affected by their use, although the standard deviation of this statistic was large;
2) in athletic activities that require a high level of instantaneous power output, athletes wearing custom-made mouthguards outperformed those wearing ready-made mouthguards;
3) athlete sensation of flexibility and sense of balance are both affected by the placebo effect.

*Key words: mouth guard / exercise ability / placebo*

## Introduction

In recent years there have been reports that mouth guards, in addition to protecting the teeth of athletes by stabilizing the occlusal contacts, actually improve competitive performance. Other reports exist, however, that those athletes who bite their mouthguards and those who feel pain because of the way the mouthguard fits on the oral mucosa perform more poorly than others. In order to clarify the effect on competitive performance, we have undertaken the experiments of this study.

## Materials and Methods

*1) The long-term effect*

To study the long-term effect of mouthguards, we selected 10 track-and-field athletes, who agreed to wear mouthguards whenever engaging in athletic activity during the three-month span of our experiment. We gave these subjects a pre-test in five athletic events: 30m dash, standing

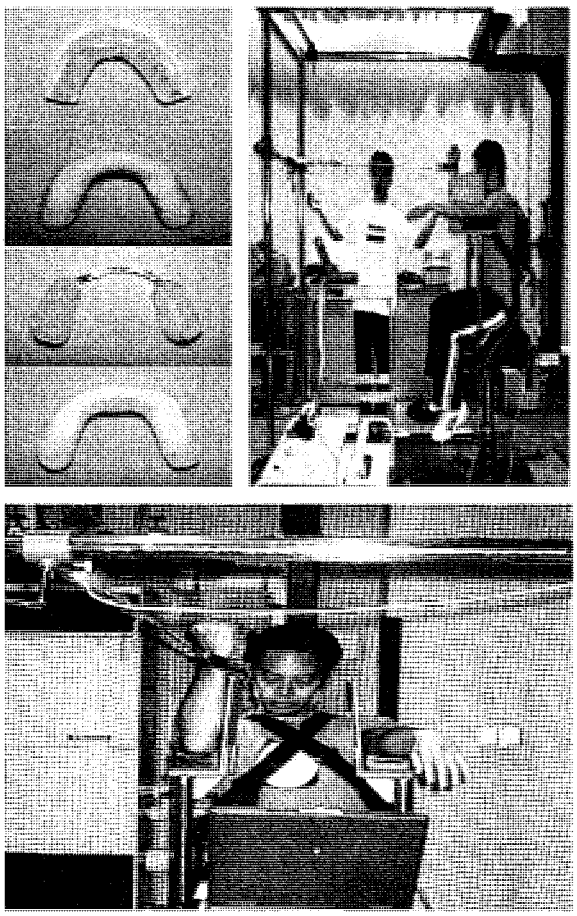

**Fig. 1.** Four types of mouthguards (From the top: Stock Type , Pro-form , Splint , Morteno ) and the view of the strength of arm curl.

long jump, standing 5-step jump, shot put, and back shot put. At the end of 3 months of wearing mouthguards for all athletic activity, we gave all 10 subjects a post-test. We statistically compared the pre- and post-tests.

*2) The kind of mouthguards*

To compare different types of mouthguards, we selected one male member of a university rugby club. He agreed to perform the same athletic activity (armcurl:Fig.1,2) with four different mouthguards. We measured the elbow joint flexure characteristics

for 10 sec at maximum muscular strength and calculated the slope of the function delta F / delta T.

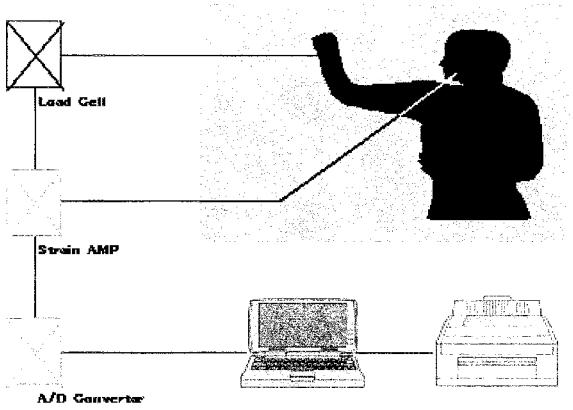


**Fig. 2.** Block diagram of arm curl.

*3) The psychological effect*

To study the psychological effect of suggestions about the benefits of using mouthguards, we selected 20 university students who wear members of an athletic club and who were willing to participate in this study. We assigned 10 students to a control group who received no suggestions about the effects of mouthguards on athletic performance. We assigned the other 10 students to the experimental placebo group. We suggested to this group that mouthguards are effective in enhancing athletic performance. We then measured a number of performance characteristics of all 20 subjects: vertical jump height, side step length, grip strength, back strength, standing truck flexion, foot balance with eyes closed. In addition, we used an anaerodash exercise (Fig. 3). to detemine peak pedal speed, peak power, time of peak, and fatigue index. We then statistically compared these two groups.

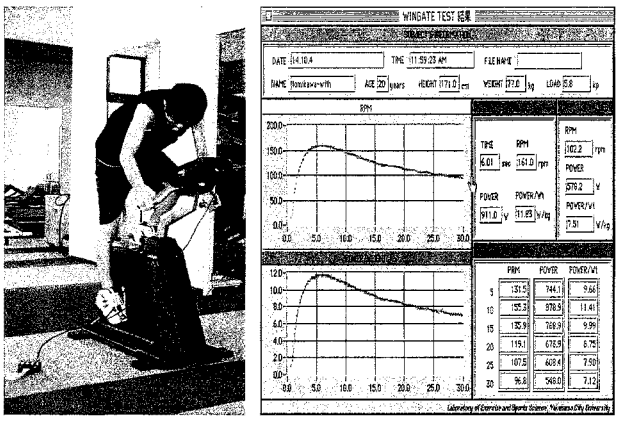

**Fig. 3.** The view of the anaerodash exercise.

## Results and Discussion

*1) The long-term effect*

There was no significant difference between the wearing group and the non-wearing group (Fig. 4). There was a low correlation, and for competitive performers who do not regularly wear mouthguards, wearing one caused performance to be worse than usual.

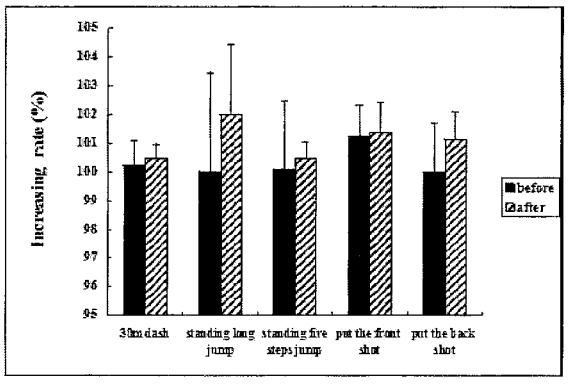


**Fig.4.** The rates of increase of the five test of wearing mouthguards.

*2) The kind of mouthguards*

Splints showed good values together. We ranked the ability of specific mouthguards to affect maximum muscular strength, as computed by the slope of the power curve, in order (most effective to least effective): Morteno, Pro-form, no splint, and ready-made (Figs.5, 6). Our data suggest that splints made of harder material have more effect on athletic activities requiring quick starts and muscular strength than do custom-made models. We feel that ready-made mouthguards may cause athletes to perform worse than those who wear custom-made models.

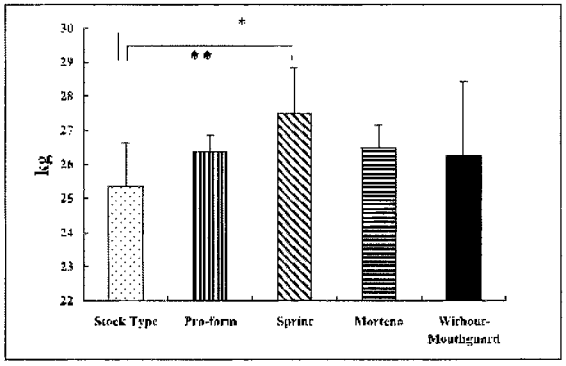


**Fig. 5.** The strength of max value of arm curl.
* <0.05 * * <0.01

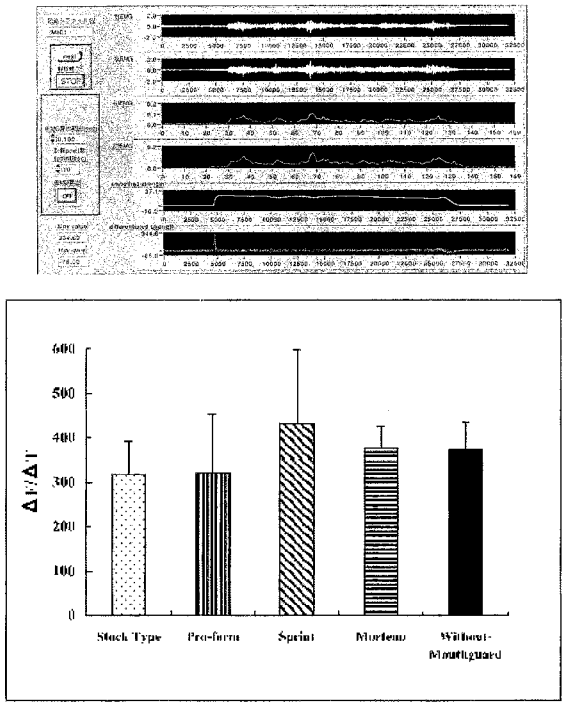


**Fig. 6.** The slope of the power curve.

*3) The psychological effect*

In a comparison of the placebo group and the control group, we found no difference between them in instantaneous power, quick sets, and muscular strength (Fig. 7). However, the possibility that the placebo effect influenced this result is suggested by the measure of flexibility while wearing a mouthguard and by the sense of balance, having been influenced by the standing trunk flexion and the foot-balance with eyes closed.

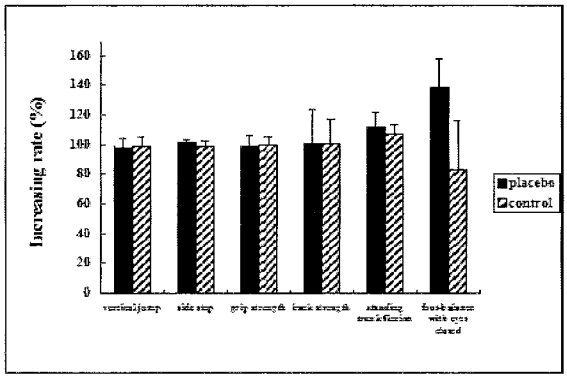


**Fig. 7.** The rate of increase of the exercise ability test

This result was better than the control group in peak pedal speed, peak power, time of peak, and fatigue index when compared to the placebo group (Fig. 8). Based on these results, we suggest that successive power is influenced by a placebo language suggestion.

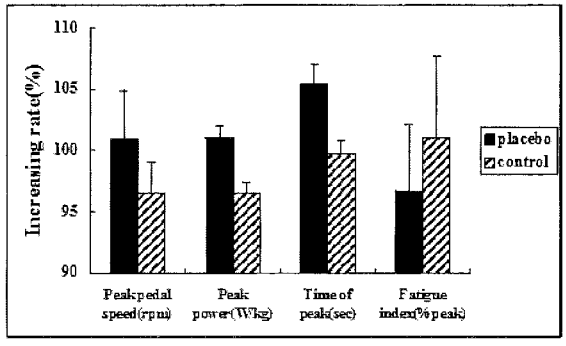


**Fig. 8.** The rates of increase of the anaerodash exercise.

## Conclusions

From the results of this investigation , which show the
following was suggested.

1) Athletes who do not regularly use mouthguards and who are compelled to perform with them are negatively affected by their use, although the standard deviation of this statistic was large.
2) In athletic activities that require a high level of instantaneous power output, athletes wearing custom-made mouthguards outperform those wearing ready-made mouthguards.
3) Athlete sensation of flexibility and sense of balance are both affected by the placebo effect.

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