

Effect of Gum Chewing Against Experimental-Induced Pain in Human Adults

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Background

The non-pharmacological intervention to pain is non-invasion and is useful for patients in clinical setting. Previous study reveal that prolonged gum chewing could inhibit the nociceptive responses by activation of the serotonergic descending pain modulate system (Mohri et al., 2005). And prolonged gum chewing is evoked a significant increase in oxygenated hemoglobin concentration in the ventral part of the prefrontal cortex (PFC)(Kamiya et al., 2010). Also, the activation of the ventral part of PFC by gum chewing could induce augmented activity of the serotonergic neurons. That is, the intervention by gum chewing with a constant rhythm is possibility to be useful for temporary pain relief in adults.

Specific Aim

The aim of study was to examine the optimal time of intervention effects by gum chewing against experimental-induced pricking pain in human adults.

Methods

Study Design

This study conducted the quasi-experimental designs.

Subjects

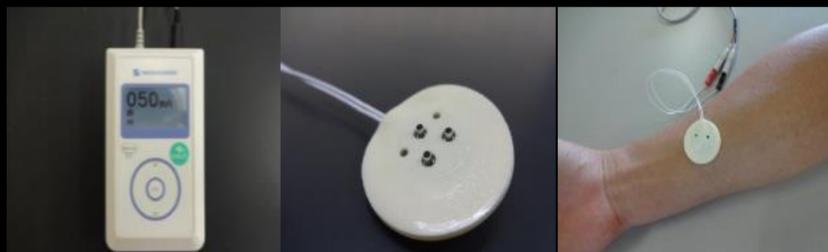
The thirteen adults (6 men) participated in this study.

Chewing gum

The subjects chewed gum to the rhythm of a metronome for sixty minutes during the experiment.

Pain Stimulus

Experimental pain was induced using the epidermal electrical device (PNS-7000). This method readily evoked pricking pain by the intra-epidermal electrical devise. The methods has been established as a reliable and valid method of pain induction. And this device is capable of stimulation A- δ fiber selectively. Experimental pricking pain was intermittently induced at right forearm of subjects five times every twenty minutes by 0.5mA fixed stimulus. Subjects sensed a pain similar to pricking by the needle.



Measurements

Interventional efficacy was quantitatively evaluated as follows: volume of acute stress substances with chromogranin A in saliva, the amount of emotional sweat and two visual analogue scales (VAS) of pain intensity and comfortableness.

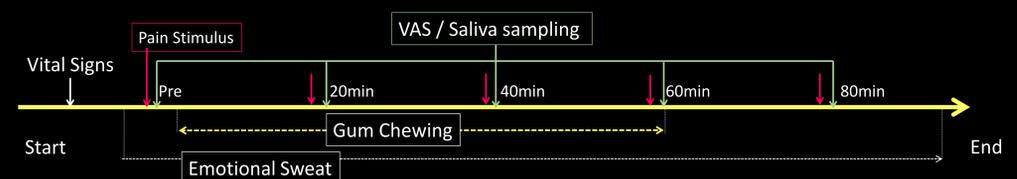
- Chromoguranin A and α -Amylase in saliva

Chromoguranin A (CgA) and alpha-amylase (AA) in saliva were used as the indicator of acute stress. Also each indicator is known to reflect pain-associated stress in humans. That is, the pain-associated stress status evaluated using CgA and SAA in subjects.

- Each visual analogue scales (range: 0-100) of comfortableness and pain intensity
- Emotional sweating

Emotional sweating is a form of sweating that accompanies psychological tension or acute stress, such as in nociception, fear, or anxiety. And emotional sweat is characterized by being limited to the palms of the hands and the soles of the feet in human.

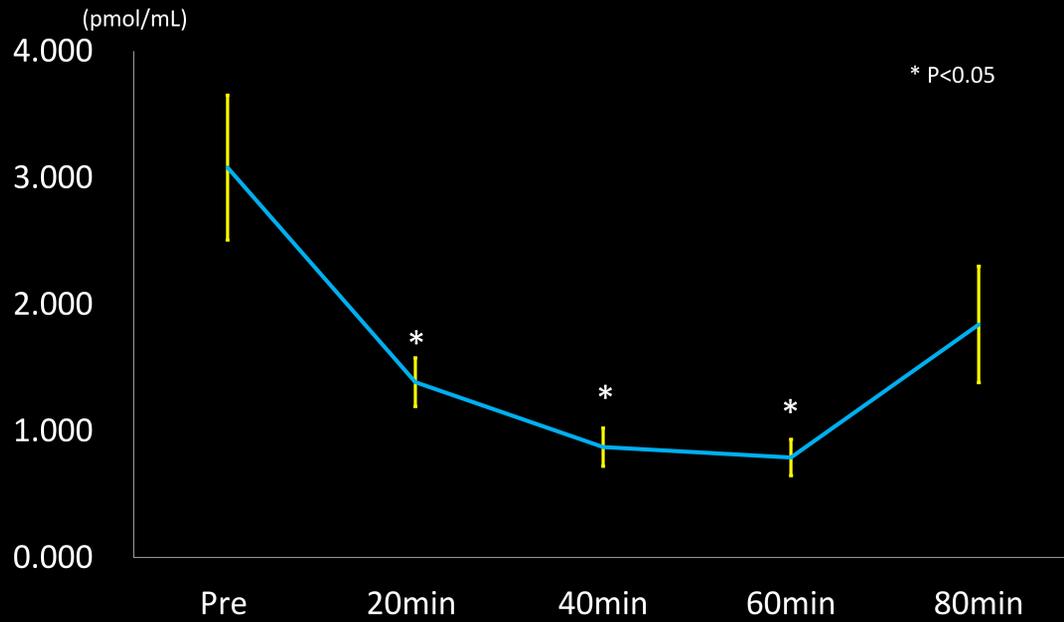
Study Protocol



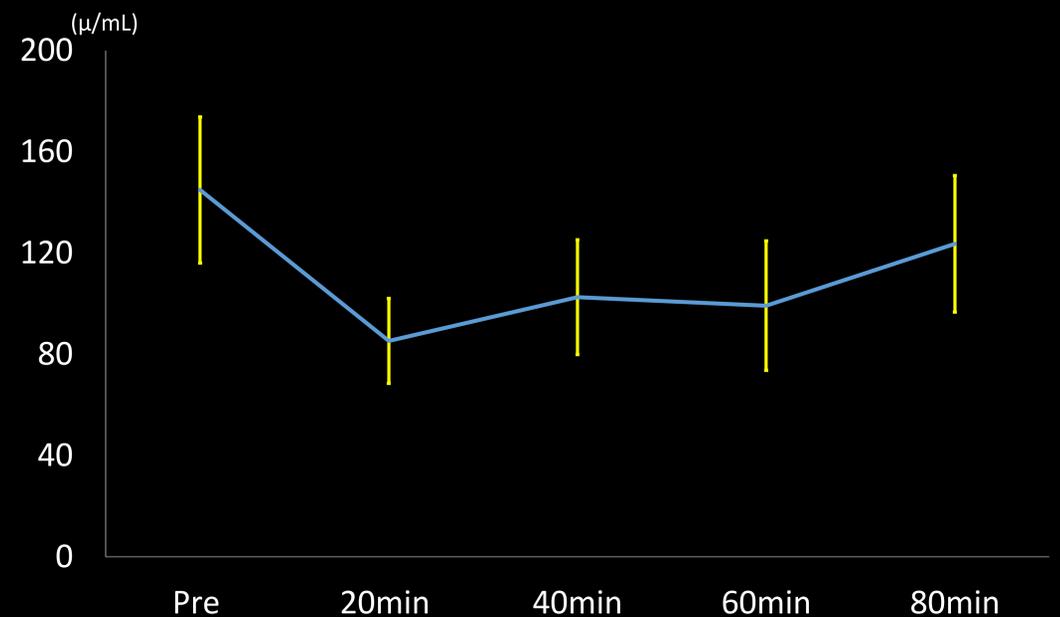
Ethical considerations

The protocol in this study is reviewed and approved by the ethical committee at the research institution at Kawasaki University in Japan. In addition, subjects signed a consent form after the purpose and procedures of study had been explained. Moreover, the conflict of interest is not existed.

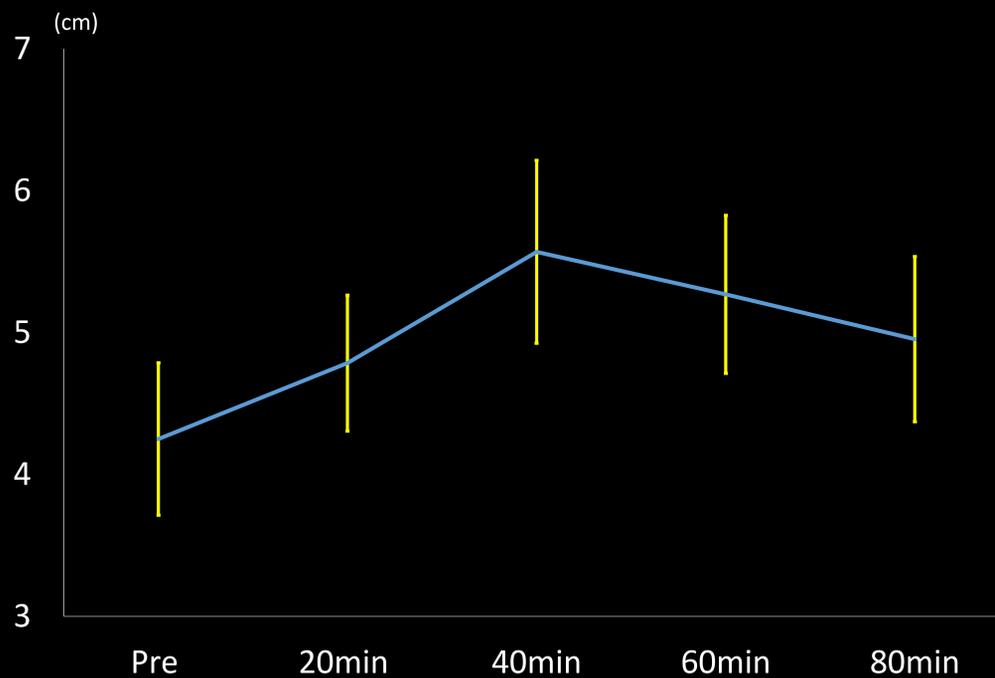
Results



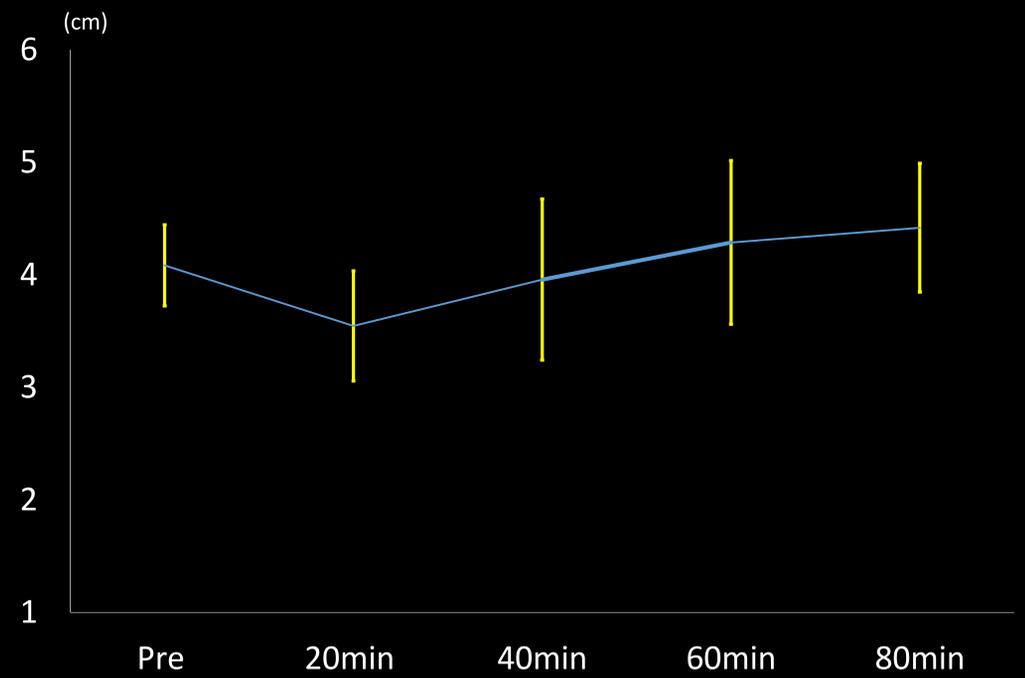
Chromogranin A in saliva



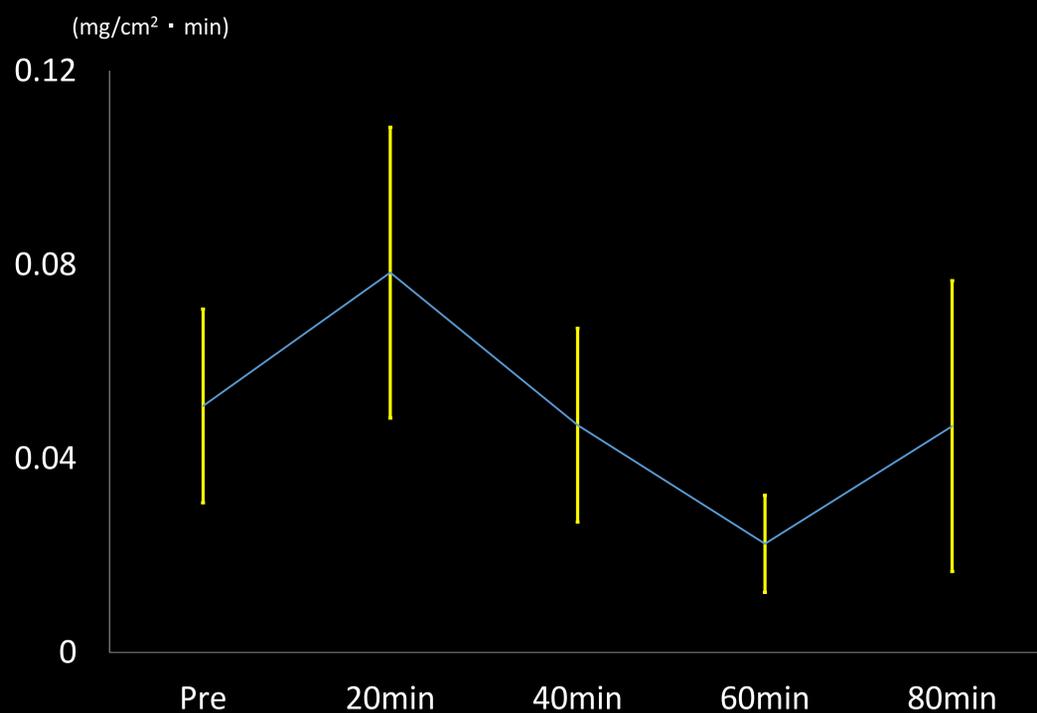
Alfa-Amylase in saliva



Pain intensity using the pain VAS



Comfortableness using the VAS



Difference of emotional sweating

Conclusion

These findings reveal that gum chewing effects by a constant rhythm against pain would appear 20 minutes on the objective pain responses of chromogranin A after the chew beginning, indicating that the chewing movement using gum might lead to short-time inhibition of acute stress related to pricking pain in adults and might be useful for temporary stress relief. Gum chewing itself is very brief and non-invasive approach. Therefore, this intervention by gum chewing would be effective for the predictable pricking pain such as injection or venipuncture, and might contribute acute stress relief as an adjunct to pricking pain in adults. In reverse, pain intensity by the pain VAS is increased after gum chewing. Thus, these results are not conclusive why the objective pain responses disagreed with the subjective responses. Therefore further study is necessary to examine the anti-nociceptive effects by gum chewing with a large number of subjects.

Acknowledgment

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References

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- Kamiya K, Fumoto M, Kikuchi H, et al.. Prolonged gum chewing evokes activation of the ventral part of prefrontal cortex and suppression of nociceptive responses: involvement of the serotonergic system. *J Med Dent Sci*, 57, 35-43, 2010.