CHEMNITZ UNIVERSITY OF TECHNOLOGY

Does the heartbeat make us tick?

The impact of heart rate and arousal on time perception

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Introduction

Popular models of prospective time perception argue that human timing is effected by two factors: (1) the pulse rate of an internal pacemaker (mainly affected by arousal), and (2) the amount of attention directed to the passage of time (e.g., Zakay & Block, 1997). While results concerning the effect of attention on timing are conclusive: the more attention is directed to a time interval, the higher its estimated duration (e.g., Grondin, 2005); mechanisms of the pacemaker are still an unresolved issue. Attempts to locate an appropriate physiological manifestation of the pacemaker have not yet been successful nor has been the search for the underlying factors of arousal that affect time perception. A promising candidate appears to be the heart rate, because it produces regular paces. However, findings concerning the impact of heart rate on time perception are far from being conclusive. The current studies were intended to shed some light on the underlying mechanisms of prospective timing, by varying heart rate and arousal independently.

Study 1

Methods

N = 30 (20 female, mean age = 25.5, SD = 6.5)

Physical conditions (within subjects):

(1) Muscle exercise: increasing arousal and heart rate
(2) Breath-holding: increasing arousal, decreasing heart rate
(3) Control condition: constant arousal and heart rate

Competing hypotheses

Heart-rate hypothesis: (heart rate influences the pacemaker directly)

Higher time estimates in the **muscle-exercise condition** compared to the breath-holding and the control condition

Subjective-arousal hypothesis: (subj. arousal determines time perception)

Higher time estimates in the **muscle-exercise and the breath-holding condition** compared to the control condition

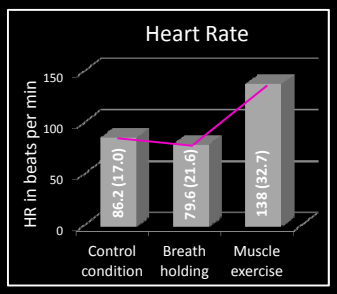
Results

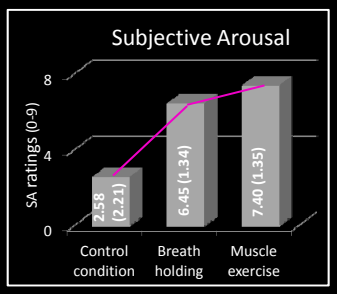
Contrast analysis for the 'heart-rate hypothesis'

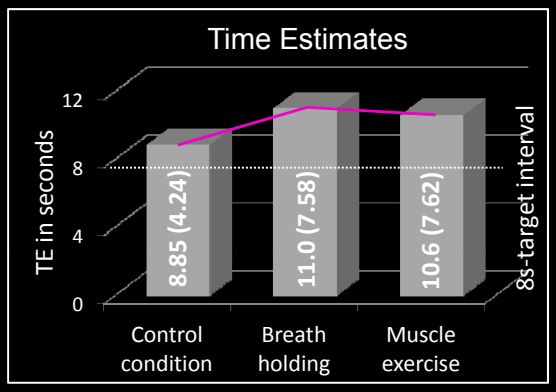
$\bar{r}$ = -.01, p = .909, g = -0.02

Contrast analysis for the 'subjective-arousal hypothesis'

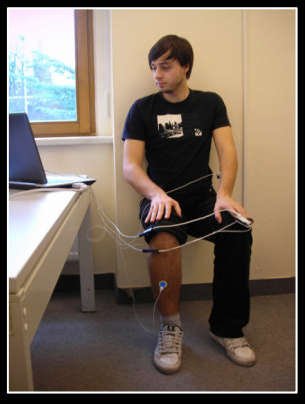
$\bar{r}$ = .19, p = .045, g = 0.38







Study 2



Participant in the muscle-exercise equipped with ECG-electrodes

Methods

N = 30 (23 female, mean age = 21.7, SD = 2.7)

A similar experimental design as in Study 1 was used with the same three physical conditions. However, a time production task was implemented in order to measure time perception with a different method (again with a target interval of 8 sec).

Results

Similar patterns as in Study 1 for heart rate and arousal were obtained:

Contrast analysis for the 'heart-rate hypothesis' $\bar{r}$ = .09, p = .470, g = 0.13

Contrast analysis for the 'subjective-arousal hypothesis' $\bar{r}$ = .36, p = .010, g = 0.50

Conclusion

The results indicate that increased arousal leads to higher time estimates, whereas heart rate has no relevant impact on time perception. Thus, it is not the heartbeat that makes us tick, but rather some kind of arousal that needs to be topic of further research.

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References

Grondin, S. (2005). Current issues related to psychological time. In S. P. Shohov (Ed.), *Advances in psychology research* (Vol. 33, pp. 65-88). Hauppauge, NY: Nova Science.

Zakay, D., & Block, R. A. (1997). Temporal Cognition. *Current Directions in Psychological Science, 6(1),* 12-16.