Interaction of heart rate, interoceptive accuracy and time perception

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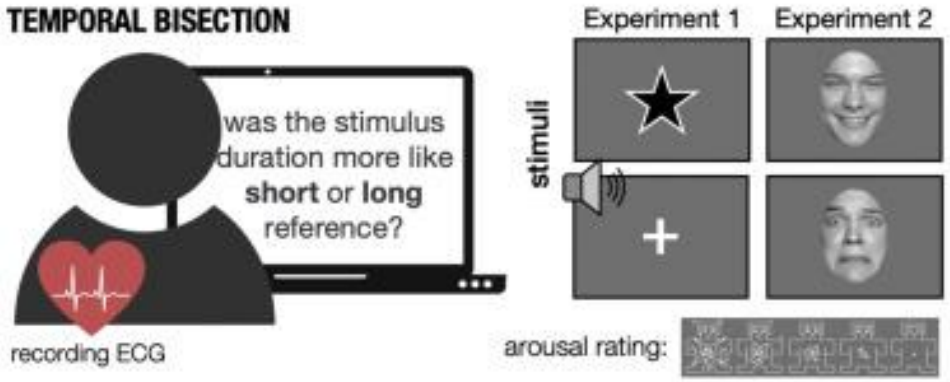
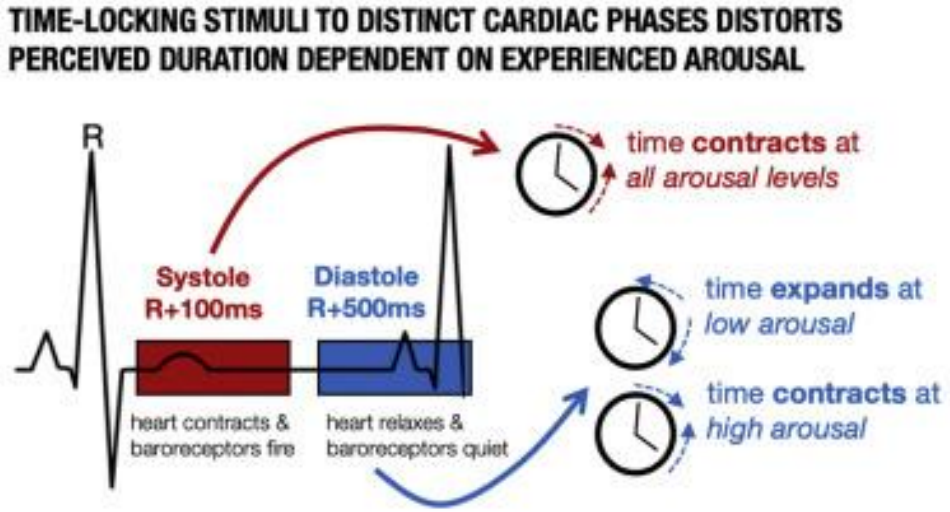
Background

- Heart rate/arousal can affect our time perception
- Interoceptive accuracy can correlate with time precision





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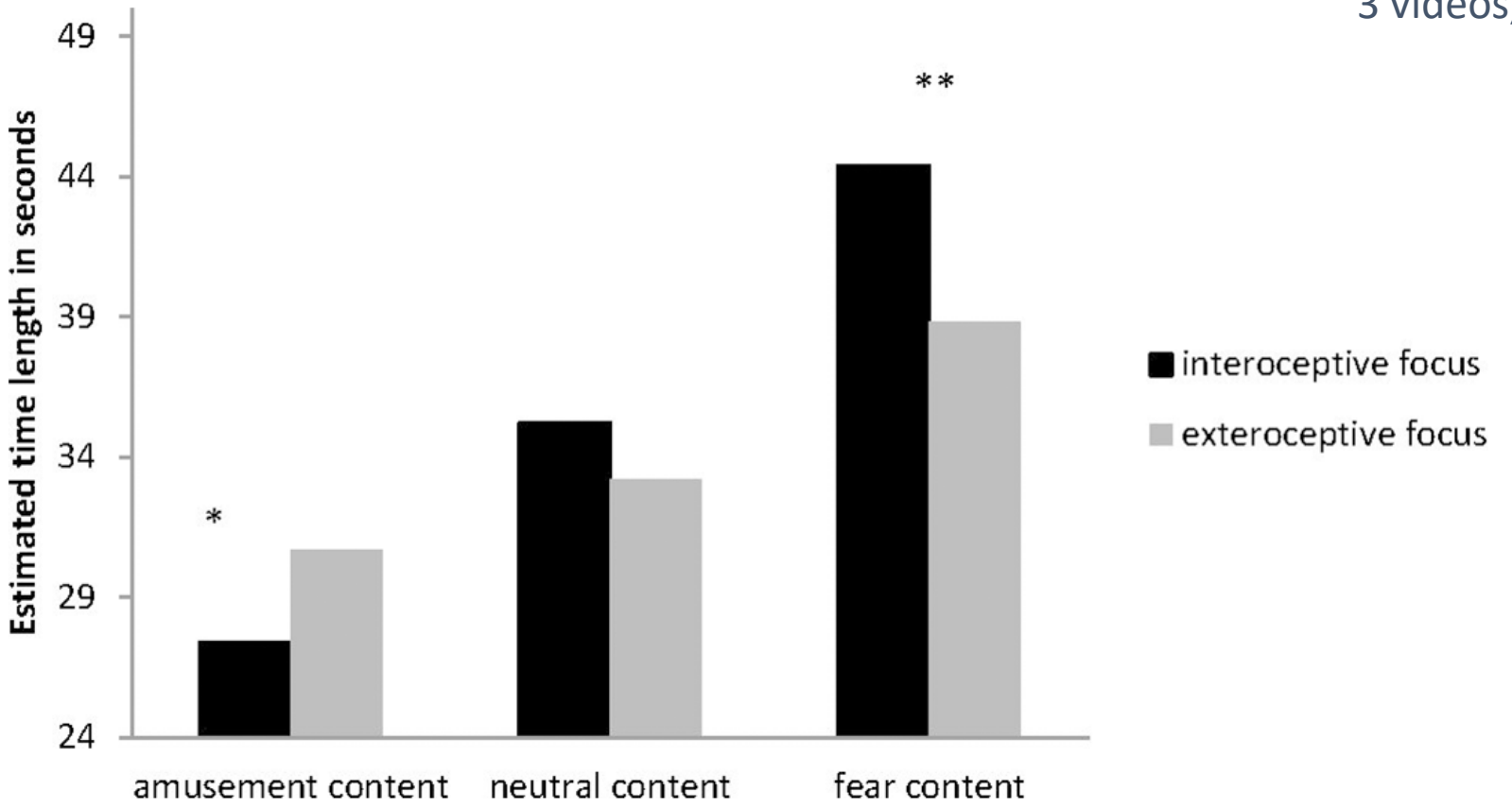
Arslanova, I., Kotsaris, V., & Tsakiris, M. (2023). Perceived time expands and contracts within each heartbeat. *Current biology : CB*, *33*(7), 1389–1395.e4. https://doi.org/10.1016/j.cub.2023.02.034

Background

3 videos, 40 sec each, 200 participants



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Experimental design

1. Internal attention focus:
keep your attention on your inner sensations

video

Estimate duration

How much you enjoyed the video? (1-10)

18 blocks

2. External attention focus:
keep your attention on the details of the video. Be prepared to answer questions about what you have watched.

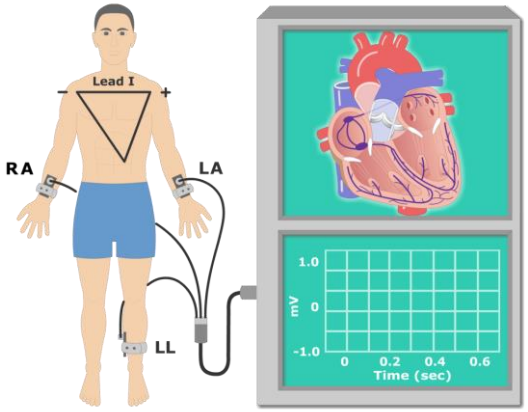
video

Estimate duration

How much you enjoyed the video? (1-10)

18 blocks

ECG measurement
Heart rate calculation



Interoceptive accuracy:
$1/6 \Sigma (1 - (| \text{actual heartbeats} - \text{reported heartbeats} |) / \text{actual hearbeats})$

3. Interoceptive accuracy measurement

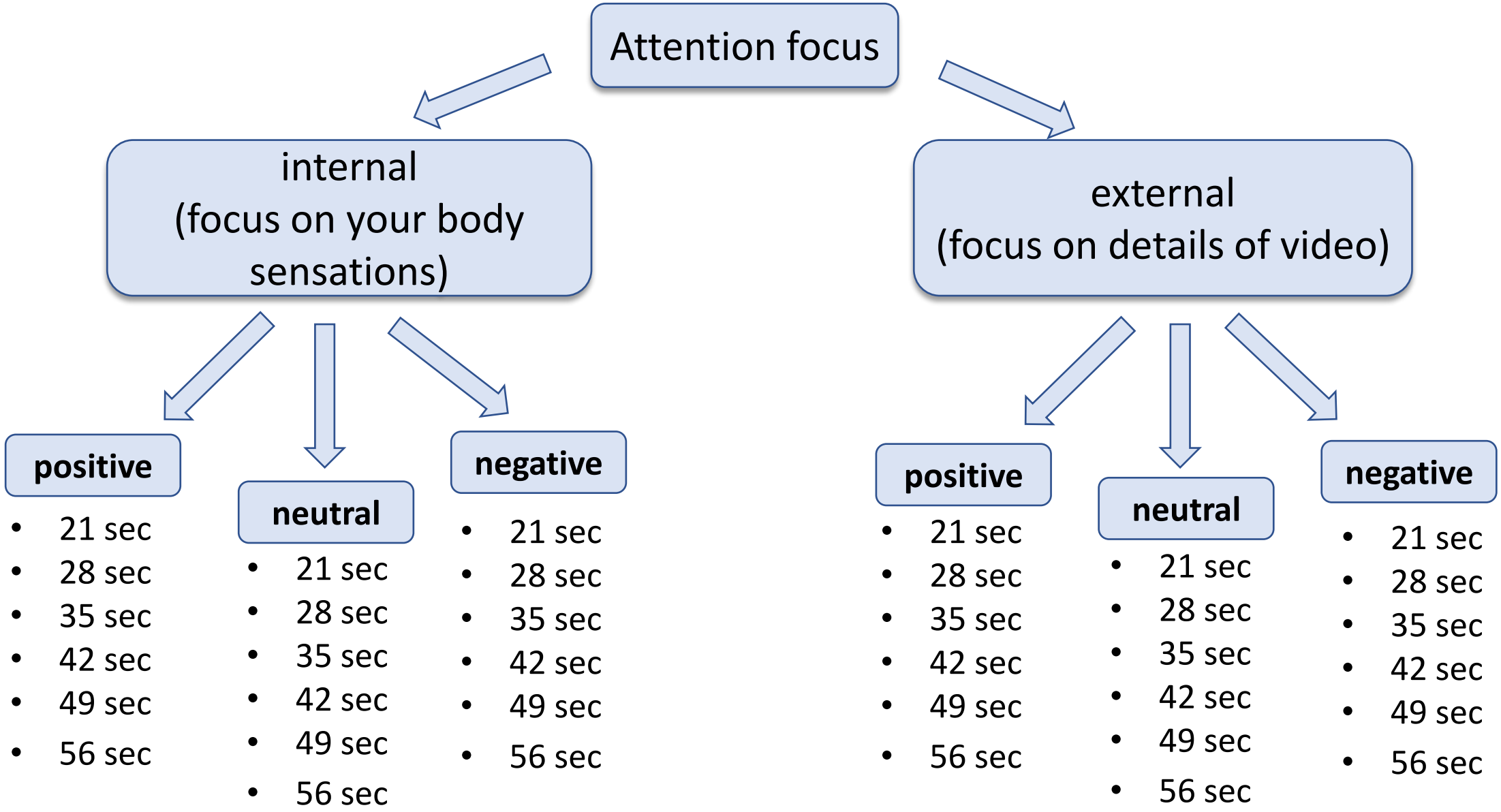
Calculate your heart beats

Response

6 blocks

Experimental design

36 videos in total



Interoceptive accuracy

$$1 / 6 \, \Sigma \, (1 - (\, | \text{actual heartbeats} - \text{reported heartbeats} \, | \,) / \text{actual heartbeats} \,)$$

Example:

Actual heartbeats	Reported heartbeats	Difference	Modulated difference	(| actual heartbeats – reported heartbeats |) / actual hearbeats	1- (…)
21	20	-1	1	1/21 = 0,048	0,952
28	30	2	2	2/28 = 0,071	0,929
35	35	0	0	0/35 = 0	1,000
42	52	10	10	10/42 = 0,238	0,762
49	39	-10	10	10/49 = 0,204	0,796
56	60	4	4	4/56 = 0,071	0,929
				Interoceptive accuracy:	**0,895**

Hypotheses

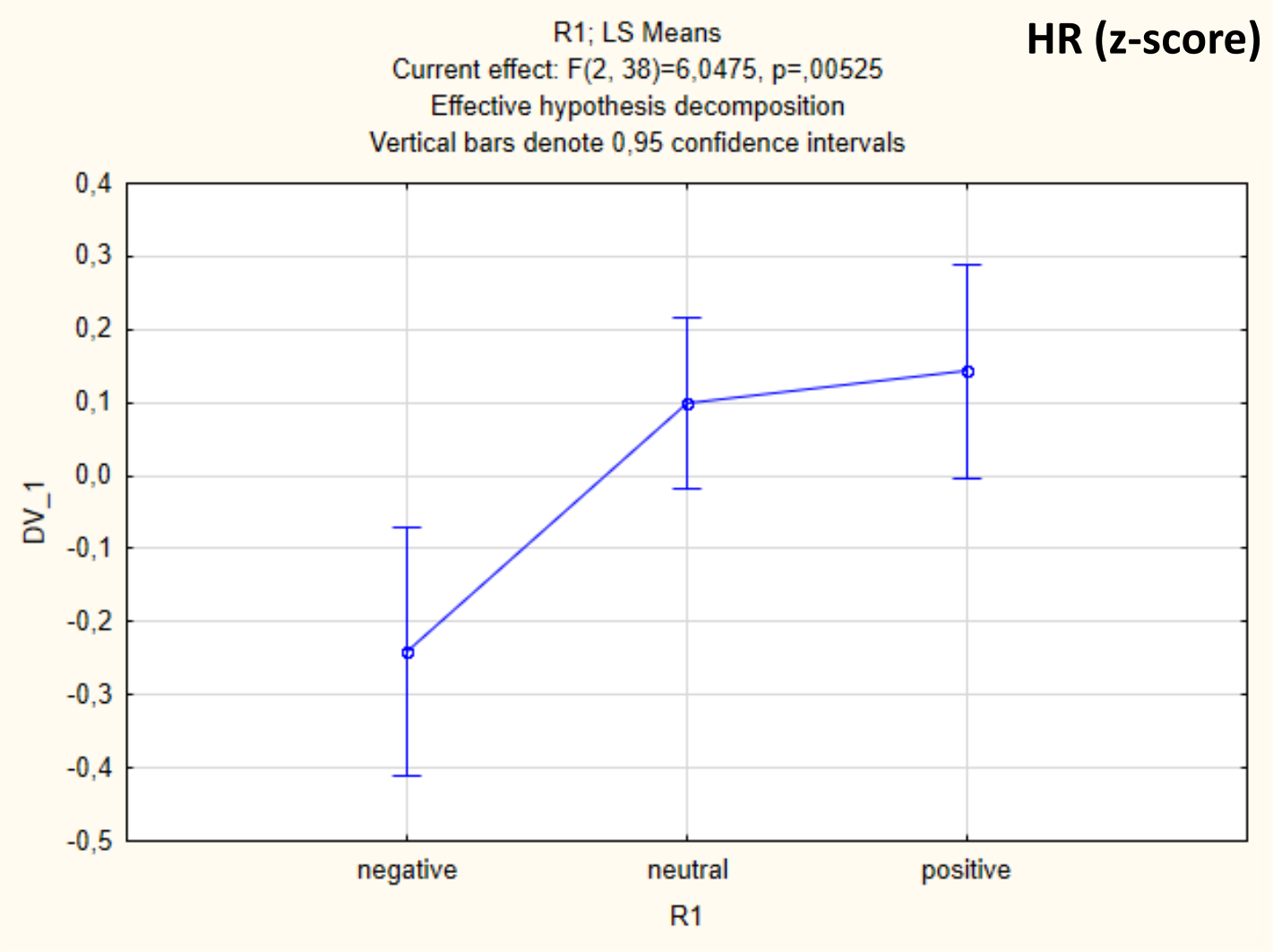
1. The emotions experienced affect the subjective perception of time

2. Changes of Heart rate affect the subjective perception of time

3. Interoceptive awareness affect influence of heart rate on the subjective perception of time

Preliminary results
(20 participants)

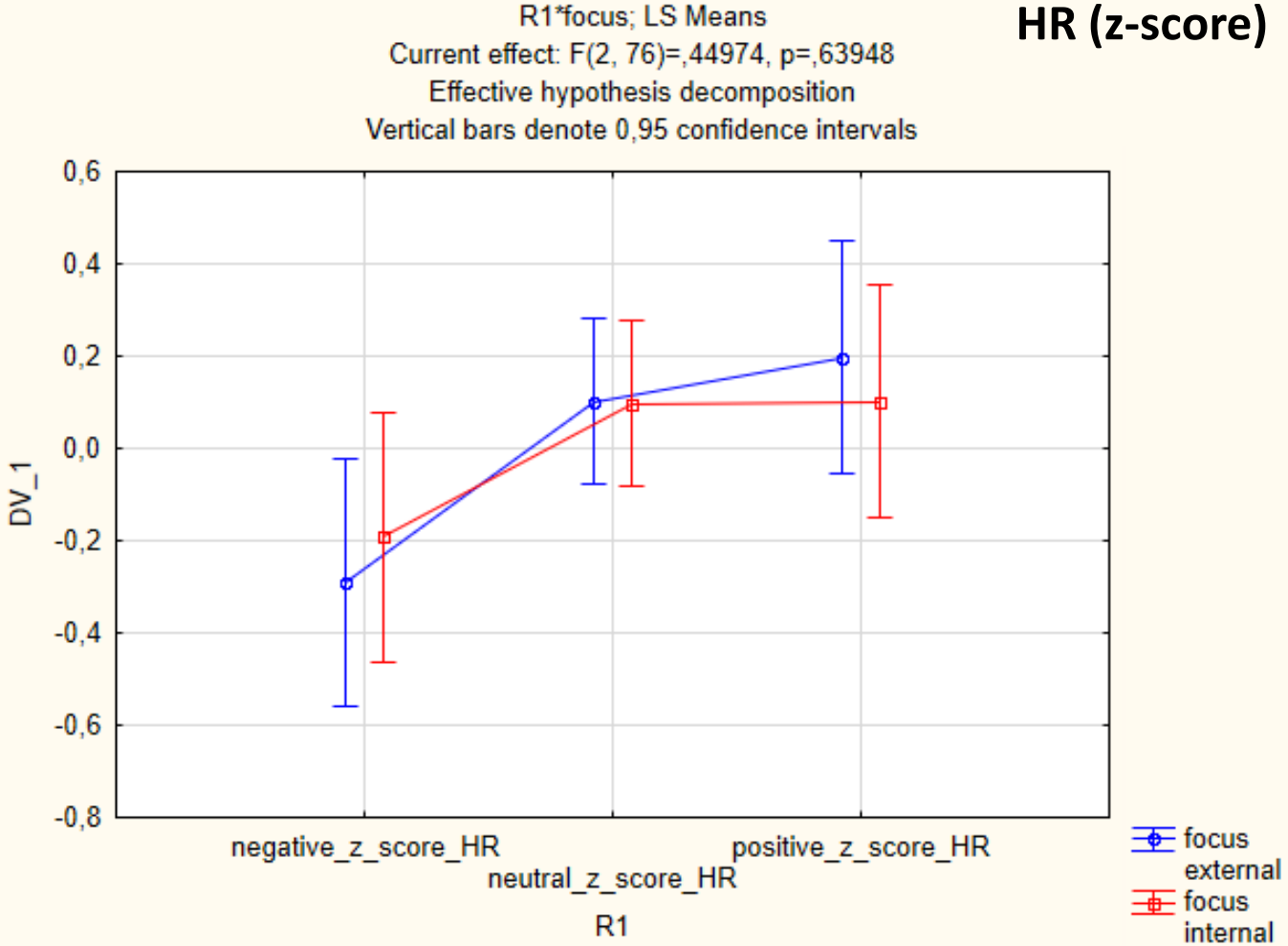
HR (z-score)



- **Heart rate was lower during watching negative videos**

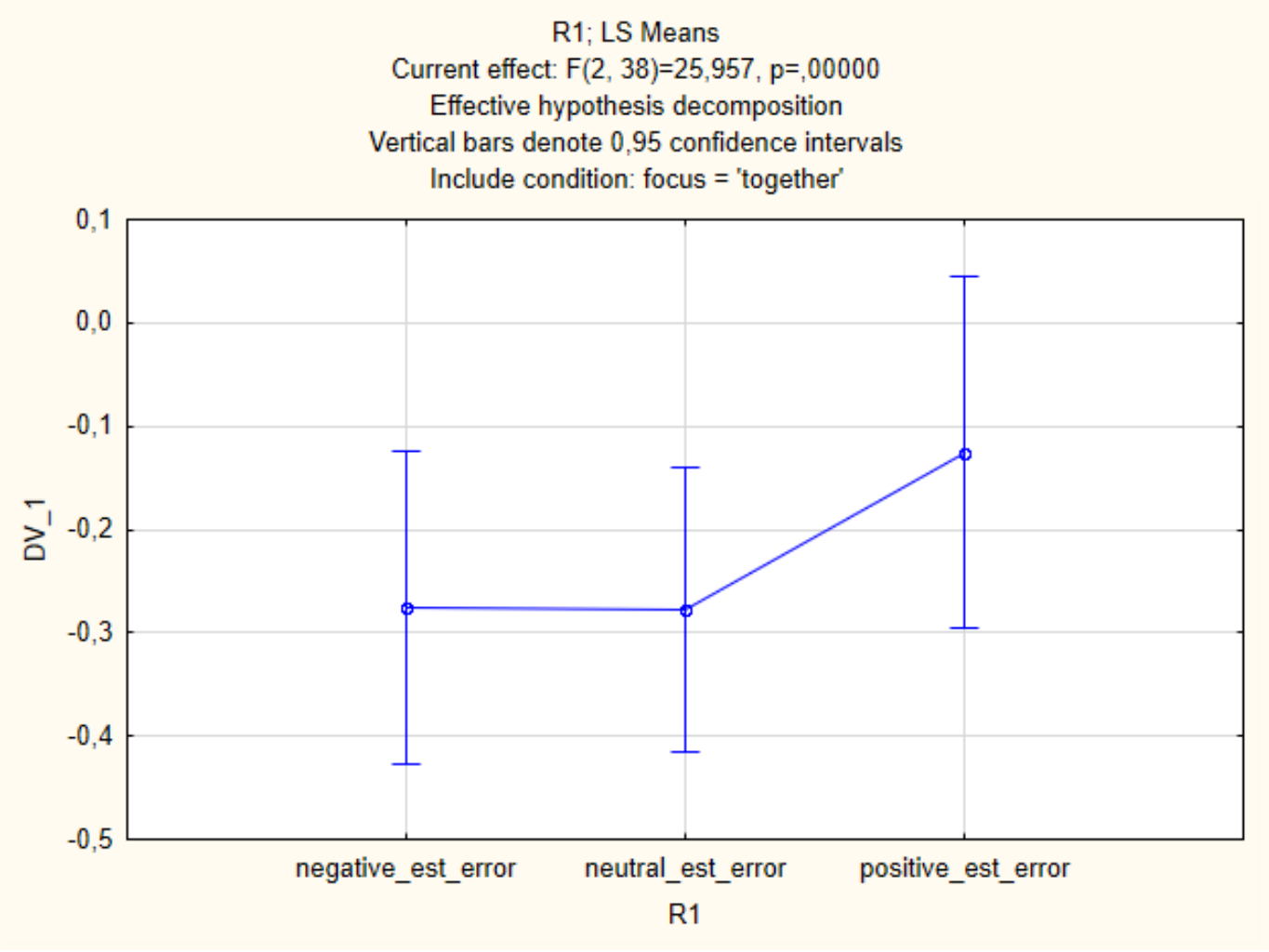
Preliminary results
(20 participants)

HR (z-score)



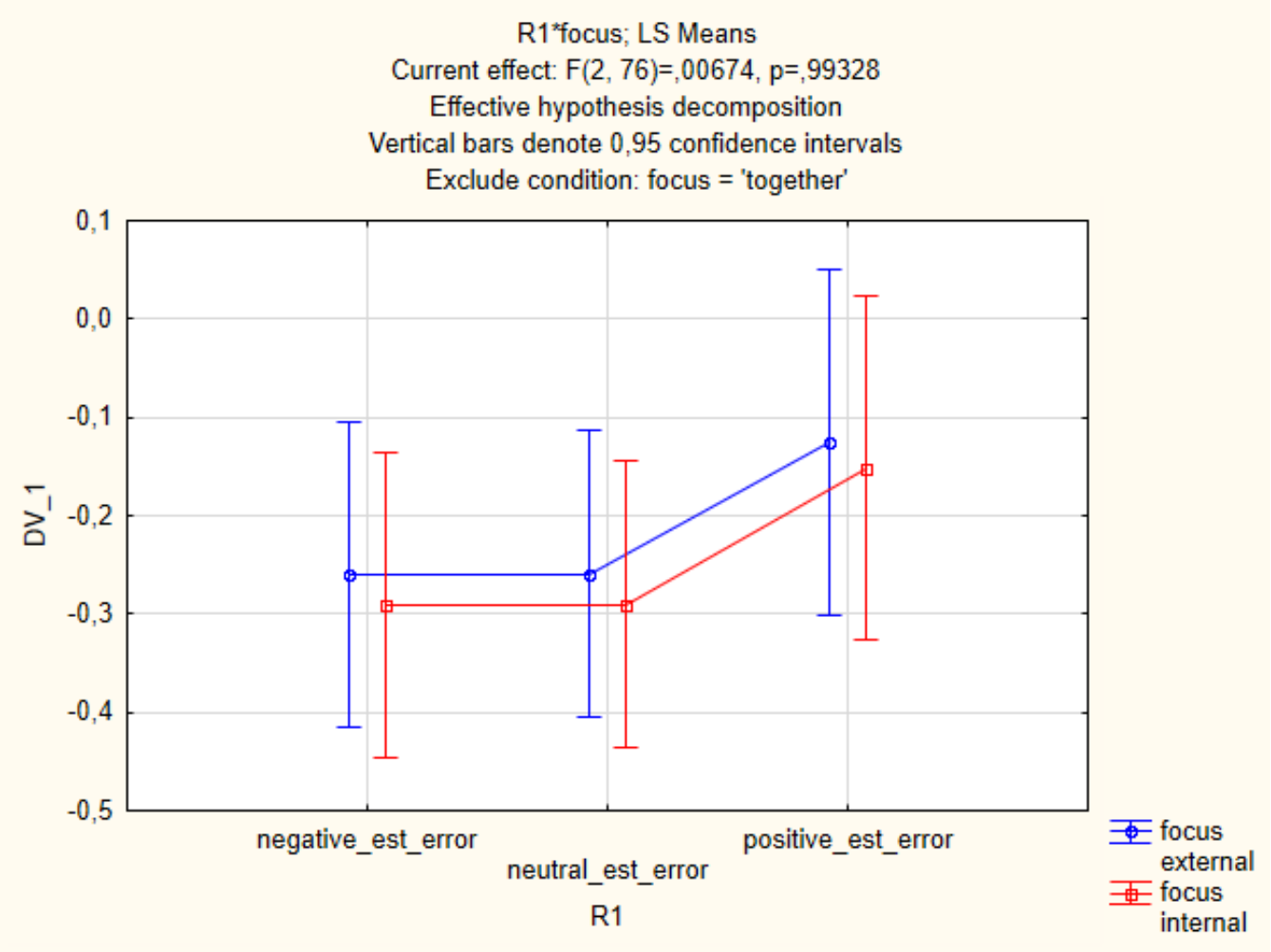
- Heart rate was lower during watching negative videos
- Attention focus didn't affect the result

Preliminary results
(20 participants)



- **Duration of negative and neutral videos was underestimated**

Preliminary results
(20 participants)



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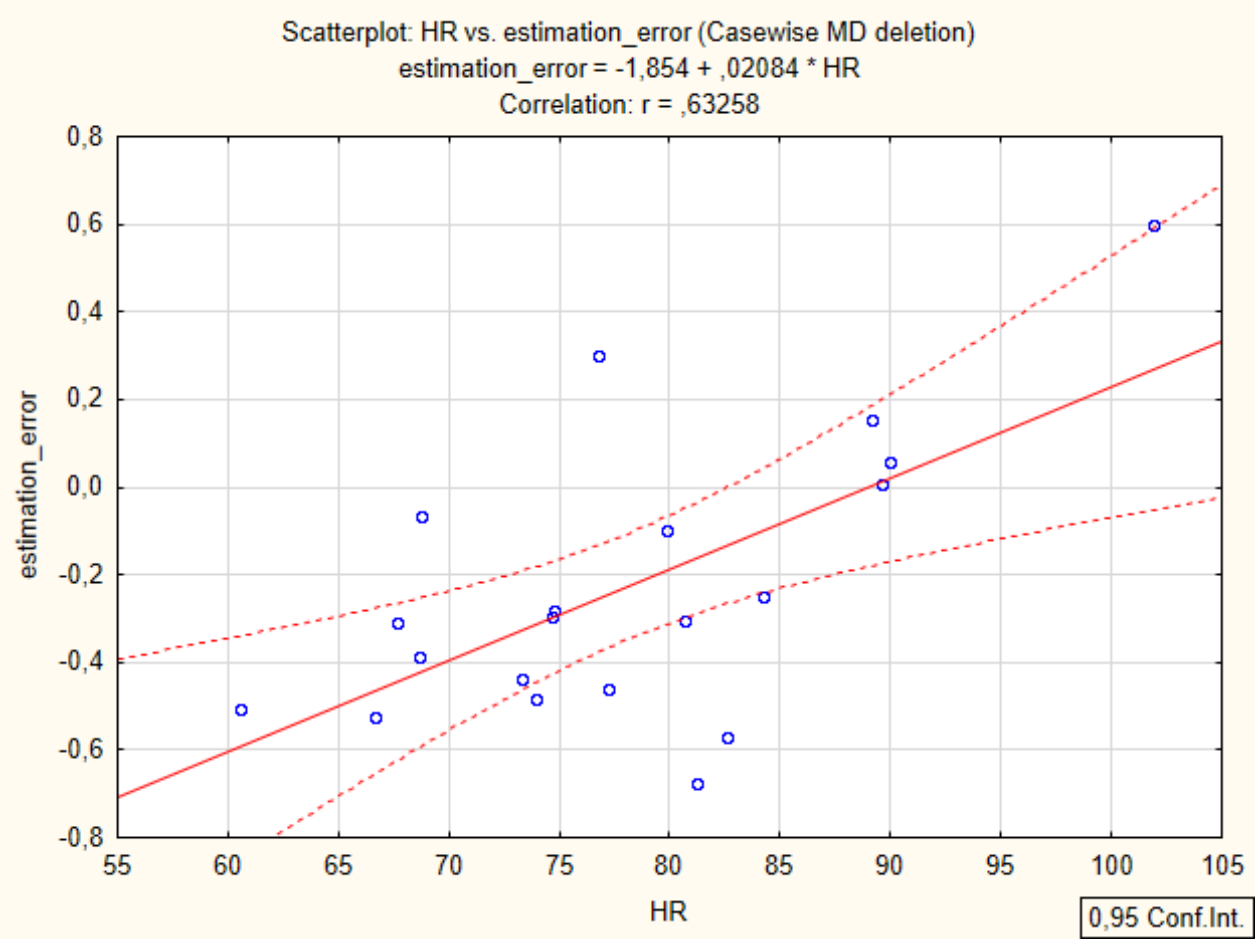
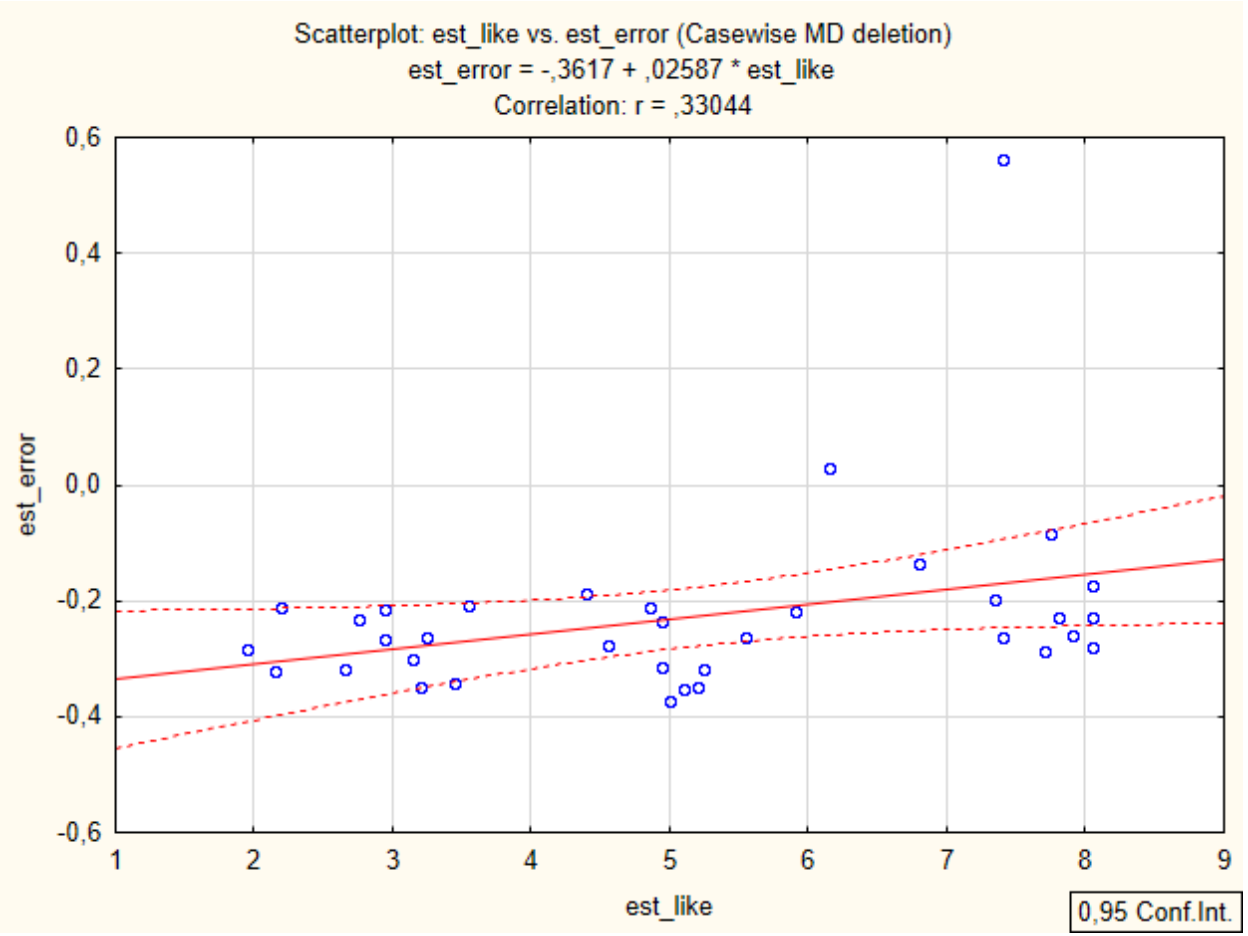
Preliminary results
(20 participants)



- Average Heart rate for person positively correlates with estimation error of video duration.
- People with high Heart rate overestimate videos duration, people with low Heart rate underestimate videos duration
- Interoceptive accuracy doesn't correlate with average estimation error

Preliminary results
(20 participants)



- **Averaged rating of video positively correlates with estimation error of video duration.**
- **Duration of unpleasant videos is underestimated**

Preliminary conclusion

1. The emotions experienced affect the subjective perception of time
2. Changes of Heart rate affect the subjective perception of time
3. Interoceptive awareness don’t affect influence of heart rate on the subjective perception of time
4. Interoceptive accuracy is not associated with accuracy of time duration estimation.