

# Physiological outcomes of suppressing positive and negative emotions in pre-schoolers

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## THEORETICAL BACKGROUND

**Expressive suppression** - the ability to deliberately inhibit emotion-expressive behavior while being aroused - is outlined a response-focused emotion regulation strategy that is initiated after the emotional experience has already started to unfold.<sup>[1]</sup> Expressive suppression develops by the time children reach primary school age.<sup>[2]</sup> **Emotion knowledge**, i.e. the understanding of emotion expressions or the knowledge of emotion regulation strategies, has been shown to support children's emotion regulation abilities, which may include expressive suppression.<sup>[3,4]</sup> Studies in adults indicate expressive suppression of negative emotions to be associated with stress-indicating **physiological arousal**, e.g., **decrease of heart rate variability**.<sup>[5]</sup> However, little is known about these associations in children. Moreover, recent neuroscientific evidence in adults suggest that the physiological consequence of suppressing positive emotions might differ from suppressing negative ones.<sup>[6]</sup>

## METHOD

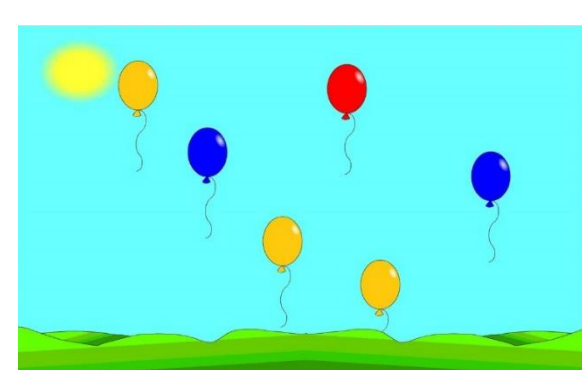
### SAMPLE

- $N = 32$  pre-schoolers ( $M_{\text{age}} = 5.4$  ys; 4.6 – 6.8 ys)
- 10 girls, 22 boys ( $\chi^2 = 4.5$ ,  $p < .05$ )

### BALLOONS GAME<sup>[7]</sup> – EMOTION REGULATION TASK

“Pop all yellow balloons!”

- 8 trials à 40 sec:
- 5 **SUCCESS** trials – child pops all balloons and wins
- 3 **FAILURE** trials – manipulated computer mouse



causes child to loose



- **Webcam** and **HRV** (via Polar® HR 9 chest strap) recording

### DESIGN

Two within-subject conditions of the Balloons Game

1. **low regulation**: without additional instruction
2. **high regulation**: child is asked to suppress any display of emotion so that:

“my colleague who will watch the tape will not be able to know, by looking at your face, whether you're winning or losing the game.”

### CODING OF EMOTIONAL EXPRESSIVITY

S S F S F S F S

- 6 trials per condition (3 **success** & 3 **failure**) were coded via FaceReader software<sup>[8]</sup>
- 20 sec per trial (5 frames/sec) were coded: 10 sec before & after the display of the image and sound indicating success or failure
- intensity codings (0-1) of 5 basic emotions (happiness, anger, sadness, fear, disgust)

## RESEARCH QUESTIONS

0. How well do pre-schoolers perform expressive suppression of positive and negative emotions?
1. How is **expressive suppression** of positive and negative emotions in pre-schoolers related to changes in **physiological arousal**?
2. How is pre-schoolers **emotion knowledge** related to the mimic-expressive and physiological outcomes of **expressive suppression** of positive and negative emotions?

### MEASURES

**Positive Expressivity**: Sum of mean intensity of happiness across all 6 trials per condition**Negative Expressivity**: Sum of mean intensity of anger, sadness, fear, disgust across all 6 trials per condition**Expressive suppression**:

- $\frac{\text{Expressivity during high regulation}}{\text{Expressivity during low regulation}} * (-1)$
- Greater values = greater suppression

**Changes in physiological arousal**:

- $\frac{\text{RMSSD}^a \text{ during high regulation}}{\text{RMSSD during low regulation}} * (-1)$
- Greater values = greater physiological arousal

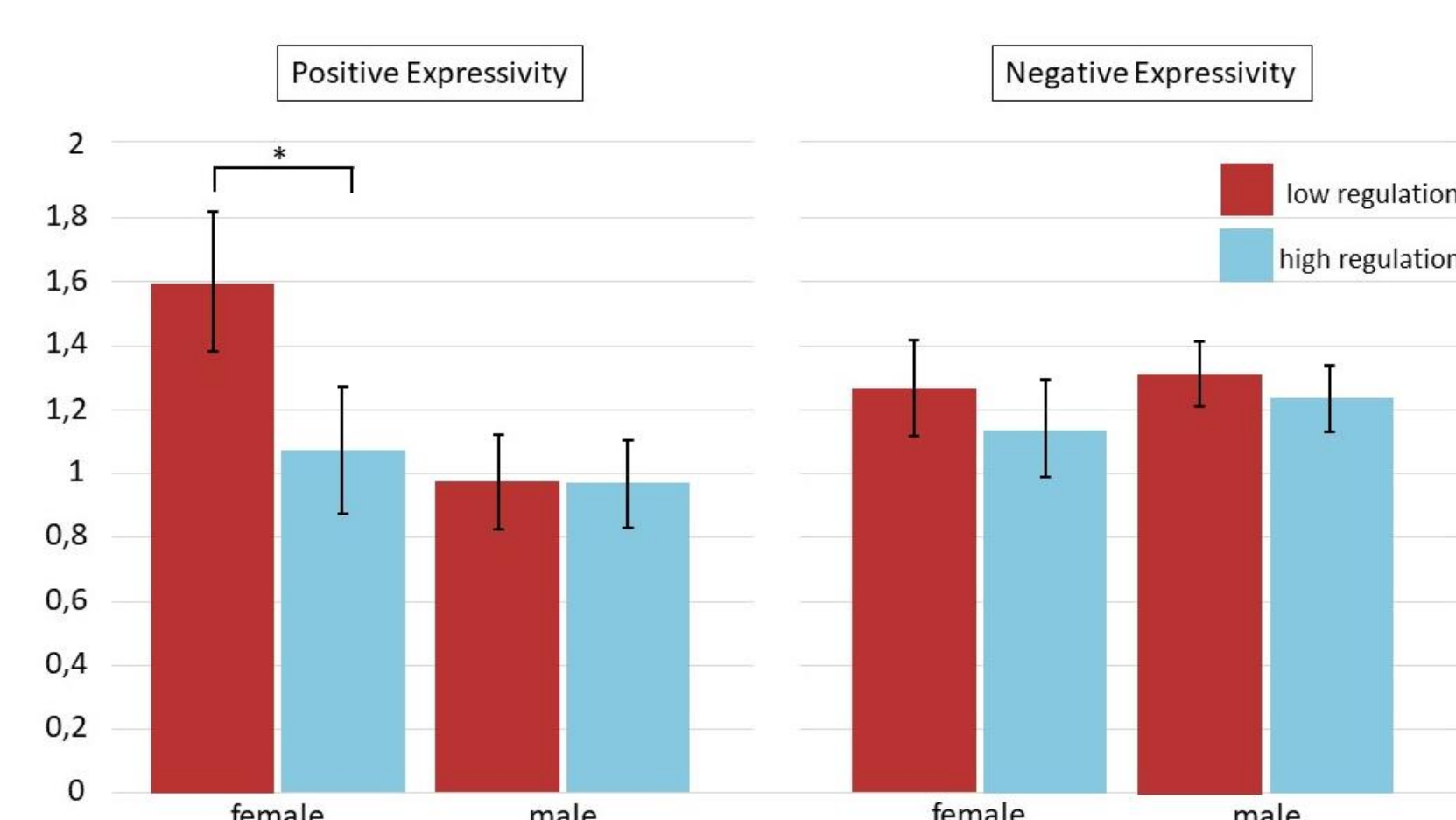
**Emotion knowledge**: IDS-2<sup>[10]</sup>

- Subscale **emotion recognition** & **emotion regulation**

<sup>a</sup> RMSSD = Root Mean Square of Successive Differences between normal heartbeats [ms]; reflects beat-to-beat variance in HR; time-domain measure used to estimate vagally mediated changes reflected in HRV.<sup>[9]</sup>

## RESULTS

### RQ0: Pre-schoolers performance of expressive suppression

Pre-schoolers show significant suppression of facial expression of positive emotions,  $F(1, 30) = 5.0$ ;  $p = .033$ ,  $\eta^2 = .14$ .An interaction with gender,  $F(1, 30) = 4.81$ ;  $p = .036$ ,  $\eta^2 = .14$ , reveals that this effect is driven by girls.Figure 1. Mean values of positive (left) and negative (right) expressivity during low- and high-regulation condition of the balloons game as a function of gender. \* $p < .05$ .

### RQ1: Physiological outcome of expressive suppression (see Fig. 2)

Expressive suppression of negative emotions is significantly related to a decrease of physiological arousal in pre-schoolers.

Table 1. Bivariate correlations (Spearman-Rho) between expressive suppression, changes in physiological arousal and emotion knowledge.

	1)	2)	3)	4)	5)
Expressive Suppression					
1) Positive	--				
2) Negative	-.257	--			
3) Increase in physiological arousal	-.239	-.416*	--		
Emotion knowledge					
4) Emotion recognition	-.094	.330*	-.072	--	
5) Knowledge of emotion regulation	.071	-.077	-.094	.430*	--
Gender	-.394*	-.066	.336*	-.305	-.357*

Note. \*.  $p < .05$ . \*.  $p \leq .065$ .

### RQ2: Relation of emotion knowledge and expressive suppression (see Fig. 3)

Emotion recognition knowledge of pre-schoolers is related to expressive suppression of negative, but not positive emotions.

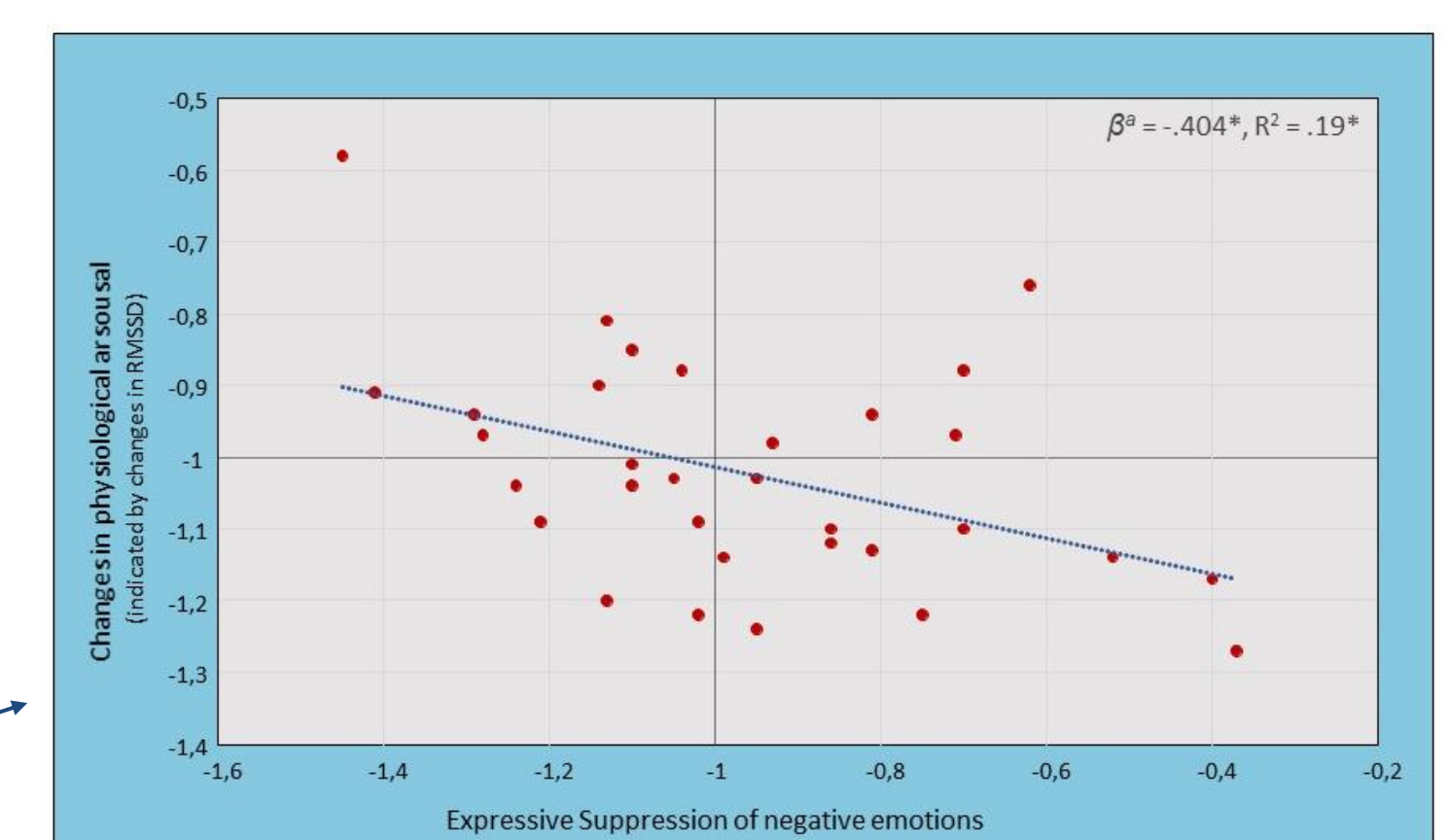
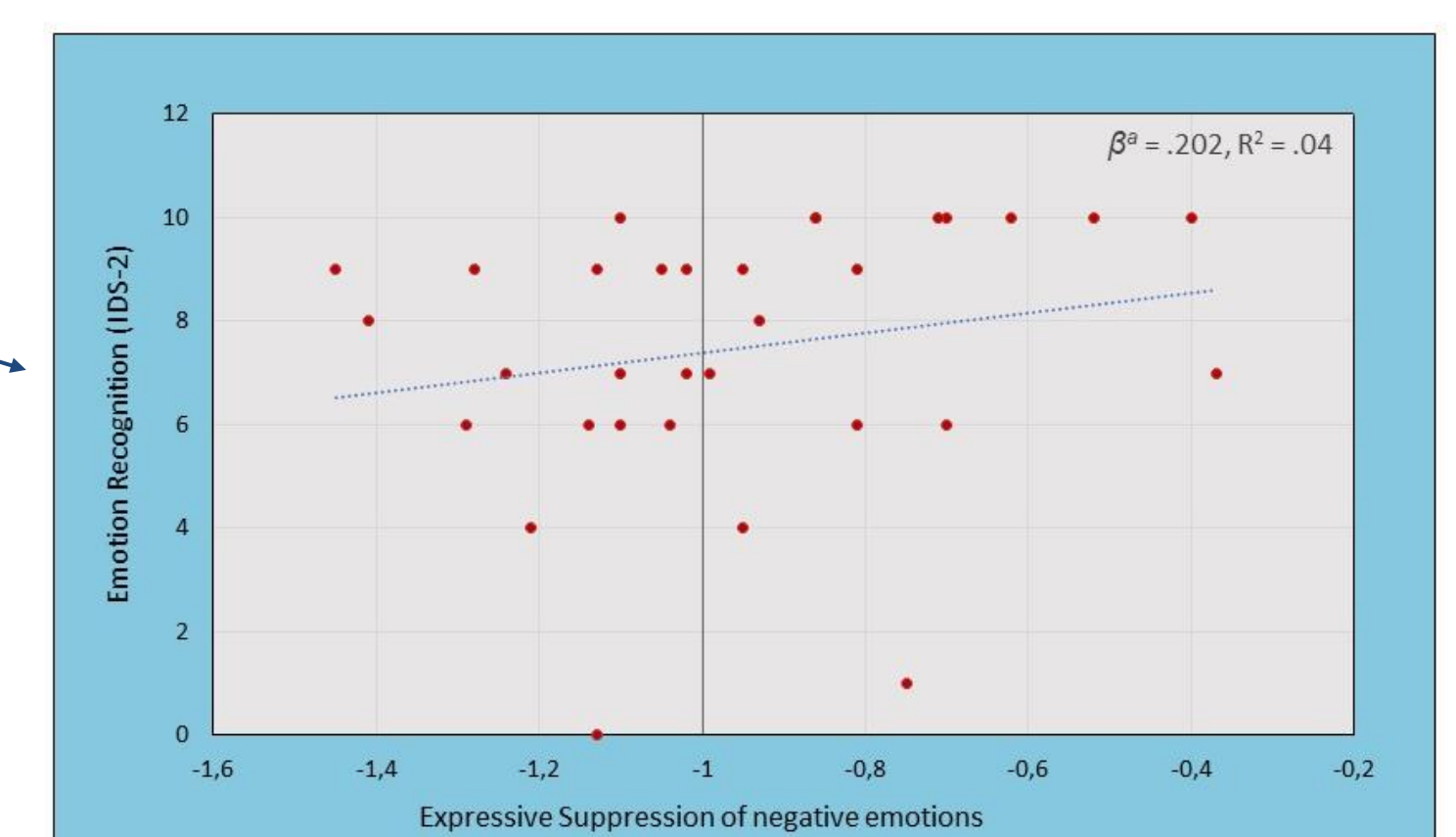
Figure 2. Relation between expressive suppression of negative emotions and changes of physiological arousal (indicated by RMSSD). \*Linear regression controlled for gender. \* $p < .05$ .

Figure 3. Relation between expressive suppression of negative emotions and emotion recognition. \*Linear regression.

## DISCUSSION

Overall, children were more successful in suppressing facial expressions of positive than negative emotions, with this effect being due to the girls in our sample. Suppression of both negative and positive emotions was associated with a decrease in physiological arousals. This physiological "calming" effect was especially and significantly shown for the expressive suppression of negative emotions. This result contradicts findings in adults and suggests that expressive suppression might be an adaptive (i.e., non or less harmful) emotion regulation strategy in children. Furthermore, a better understanding of emotion expressions seems to facilitate the expressive suppression of negative emotions. However, we found no significant association between children's emotion knowledge and the physiological outcome of expressive suppression.

Our results suggest that expressive suppression of positive emotions is easier for pre-school children than expressive suppression of negative emotions. However, it is the suppression of negative emotions that seems to have a stronger (calming) effect at the physiological level and could particularly benefit from the promotion of emotion knowledge.

## REFERENCES

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