

Harnessing physiology in anxiety management

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Dental fear and anxiety

- **Dental fear** is an emotional reaction to one or more specific threatening stimuli within the dental situation.
- **Dental anxiety** is a state of apprehension that something bad will happen in relation to dental treatment, together with a sense of losing control.

The **global estimated prevalence** of dental fear and anxiety in adults are about **15.3 %** (95 %CI 10.2-21.2); the majority **developed it during childhood** (Silveira et al., 2021).

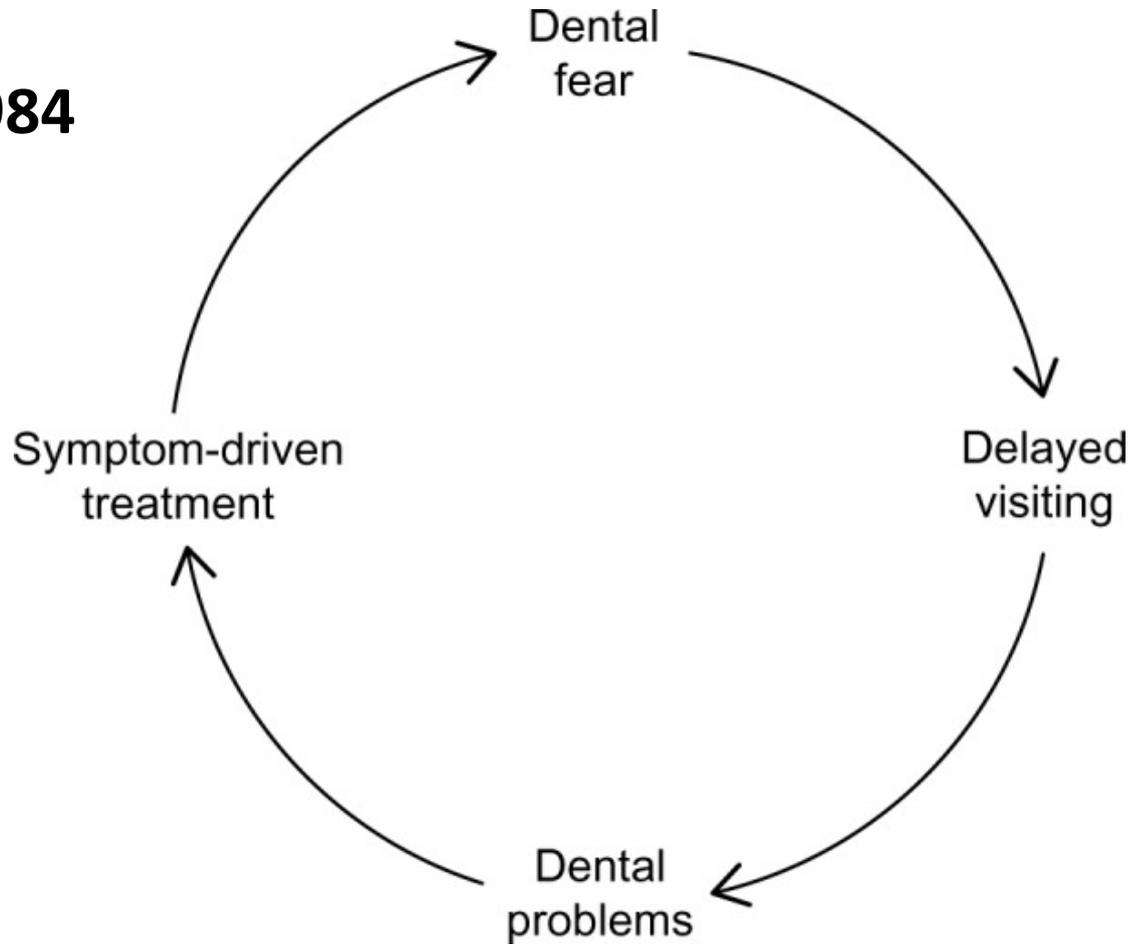
Impact and consequences of dental fear

- Fear and anxiety toward the dentist and dental treatment are both **significant contributors to avoidance of dental care**
- Both children and adults having high levels of dental fear are **difficult to manage, require more treatment time and resources**, and their behavioural problems often lead to a **stressful and unpleasant experience for both the patient and the dentist**

Several studies provide clear demonstration of the **existence of oral health disparities in individuals with extreme dental fear** compared to the general population

The vicious cycle of dental fear

Berggren, 1984



Identifying dentally anxious children

Important to treat dental anxiety and fear since childhood, in order to **prevent the development and establishment of avoidant and uncooperative behaviours**, which can persist into adulthood

1. **Direct observation** of the child's behavioural response or physiological state in the dental context;
2. **Parent-report** questionnaires;
3. **Self-report scales** completed by the child.

Observational studies show that **uncooperative behaviours do not always reflect the anxiety state**, namely the expressed behaviour does not necessarily correspond to the psychological state of children



ANS physiology

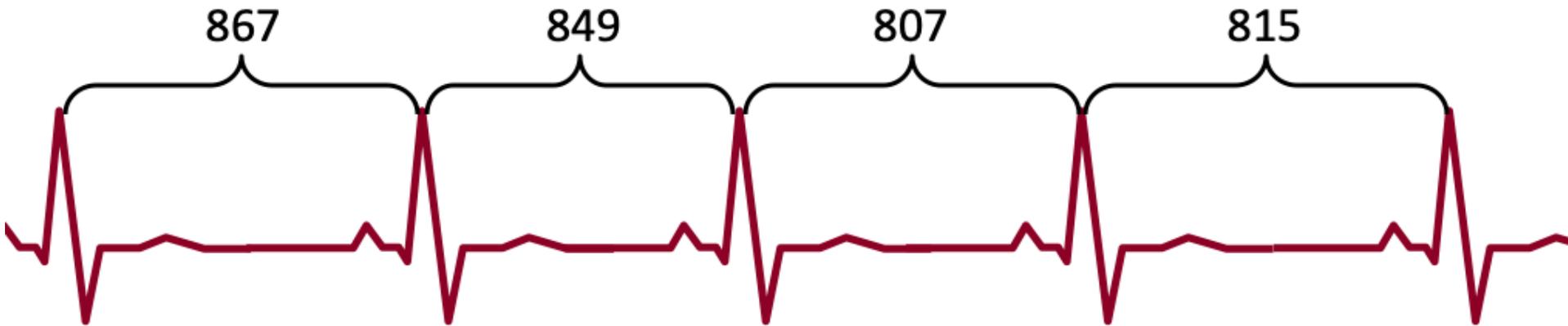
Non-pharmacological management of children's dental fear

There is a wide range of strategies available to assist the dental team: **tell-show-do technique**, music therapy, videos, magic tricks, positive reinforcement, systematic desensitization, and modelling.

However

1. Need to **integrate such interventions into general dental practice**
2. Significant **time and resource constraints**
3. Dentists themselves can be **skeptical or unwilling** to employ psychological techniques in their practice

Heart Rate Variability Biofeedback

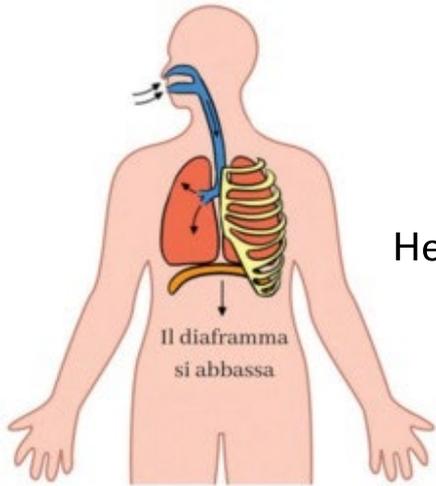


Higher resting HRV in children:

- Better **emotion regulation** (e.g., DeWitte et al., 2016)
- Lower levels of **stress, fear, and anxiety** (e.g., Michels et al., 2013)
- Lower levels of **depressive symptoms** (Koenig et al., 2016)

Cardio-respiratory coupling

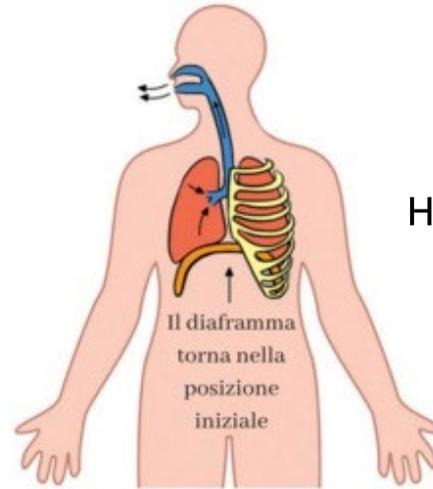
Inhaling



Heart Rate increases

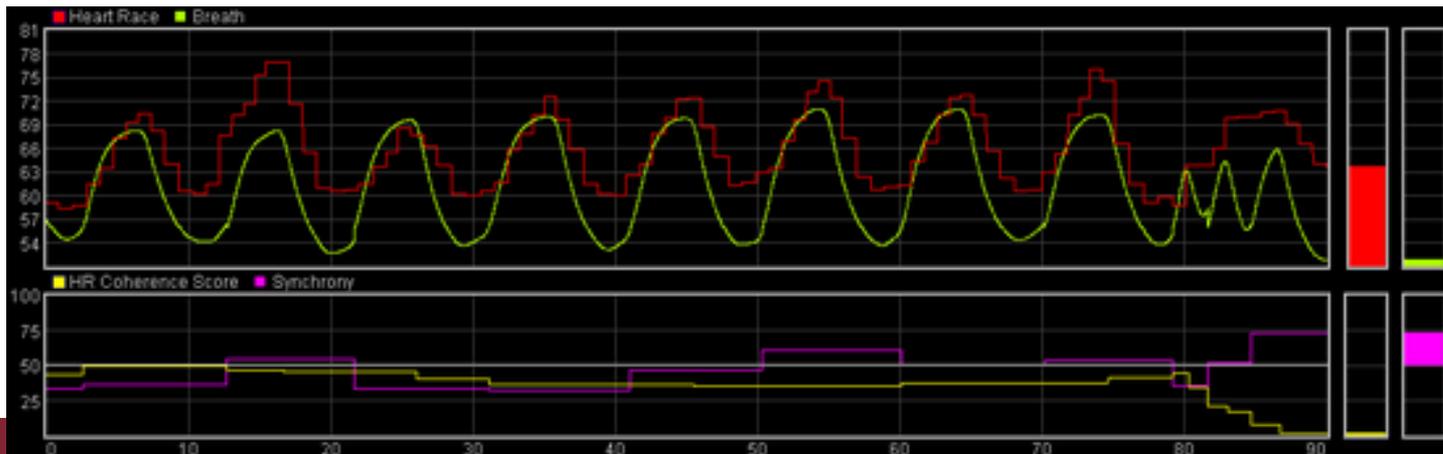
Il diaframma
si abbassa

Exhaling



Heart Rate decreases

Il diaframma
torna nella
posizione
iniziale



Heart rate variability in the assessment and biofeedback training of common mental health problems in children

Pop-Jordanova Nada ¹

The **Journal of Pain** **USASP**
U.S. ASSOCIATION FOR THE STUDY OF PAIN

ABSTRACT ONLY | VOLUME 13, ISSUE 4, SUPPLEMENT , S93, APRIL 01, 2012

Heart rate variability biofeedback therapy for children and adolescents with chronic pain

A. Yetwin • K. Marks • T. Bell • J. Gold

The role of heart rate variability biofeedback in pediatric chronic pain rehabilitation: A case series design.

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Journal Article

Aim and hypotheses

To test the feasibility of HRV-B to **reduce pain and negative feelings** of children during dental treatment.

Compared to the control group, the **HRV-B condition would:**

- I) show **reduced physiological and self-reported measures of anxiety and pain**
- II) have **visits of shorter average duration**

Methods

 Paediatric Dentistry
Unit of the Department
of Oral and Maxillofacial Science,
Sapienza University of Rome



Participants

- N = 25 children (14 M; 11 F)
- Age range: 7-13 years
- Exclusionary criteria: dental phobia assessed via the Children's Fear Survey Schedule – Dental Subscale (CFSS-DS; Cuthbert & Melamed, 1982)

Materials and measures

Questionnaires

- Children's Fear Survey Schedule – Dental Subscale (CFSS-DS; Cuthbert & Melamed, 1982)
15 items (e.g. «*How afraid are you of the sight of the dentist's drill?*»); Likert scale response type format from «1 = not scared at all» to «5 = very scared».
- Multidimensional Anxiety Scale for Children (MASC; March et al., 1997)
39 items (e.g. «*I sleep next to someone of my family*»); from «0 = never» to «3 = always».

Materials and measures

Questionnaires

- Children's Depression Scale (CDS; Lang & Tisher, 1978)
8 from 66 items were selected (e.g. «*I often think I have done something wrong*»); from «0 = very wrong; unlike me» to «3 = very right; like me».
- Children's Response Style Questionnaire (CRSQ; Abela et al., 2000)
25 items (e.g. «*Think about how alone you feel*»); from «0 = almost never» to «3 = nearly always».

Materials and measures

Visual Analogue Scales (VAS)

During baseline and recovery periods to assess current levels of:

- Happiness
- Fear
- Anger
- Sadness
- Pain

i.e. «*How sad are you feeling?*» From «0 = not at all» to «10 = very much».

Example of Visual Analog Scale (VAS)

Not sad at all

Very sad

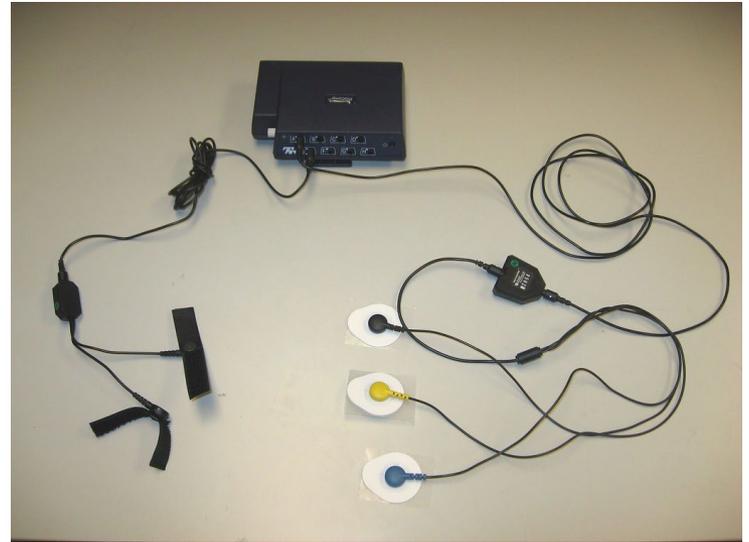


Materials and measures

Physiological assessment

A portable device to record:

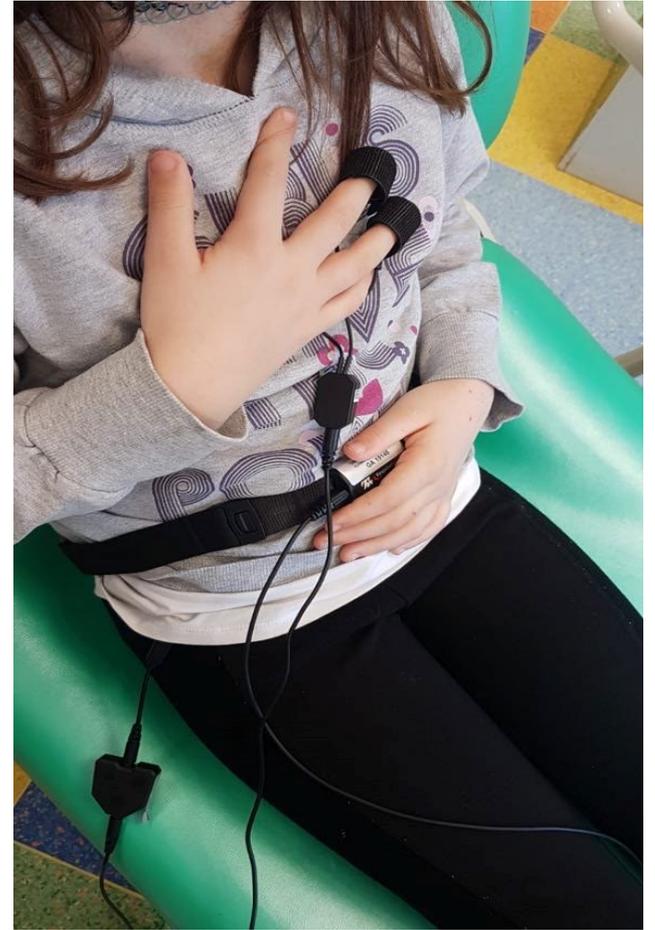
- Electrocardiography (ECG)
- Skin conductance response (SCR)
- Respiration (amplitude and frequency)
- Heart Rate Variability (HRV)



Intervention

During HRV biofeedback children were instructed to breath diaphragmatically

«Imagine you have a balloon of your favourite colour in your belly»



Experimental protocol

Informed consent signed by parents

CFSS-DS to exclude the presence of a proper dental phobia

Questionnaires

Random assignment to TAU or HRV-B

Electrodes attachment

Baseline physiological assessment (3 min) and VAS

TAU or HRV-B

Recording of dental treatment duration

Recovery physiological assessment (3 min) and VAS

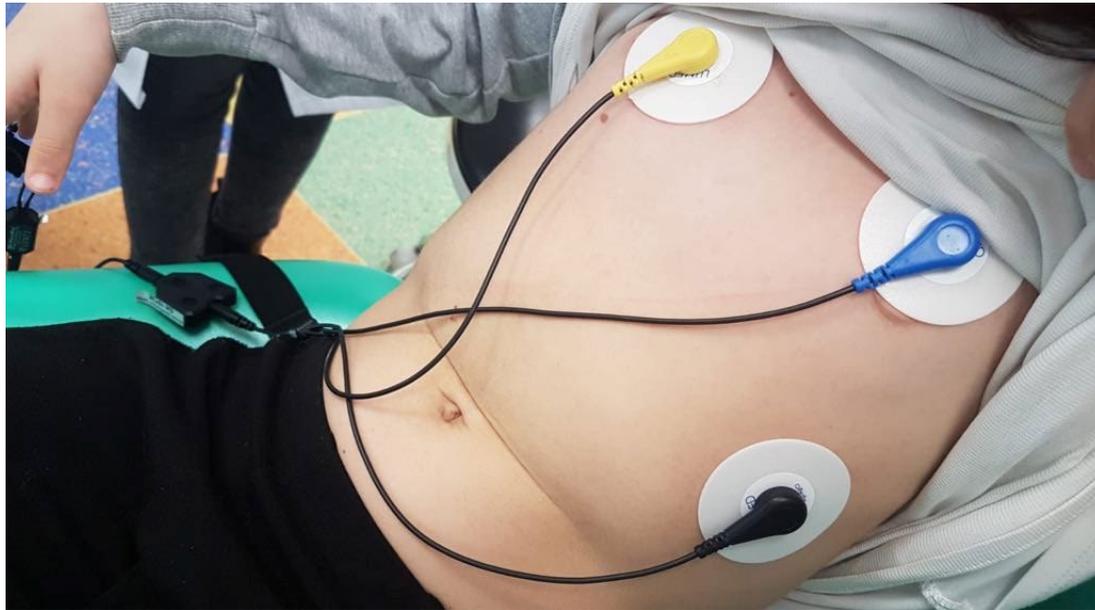
Experimental protocol

Questionnaires



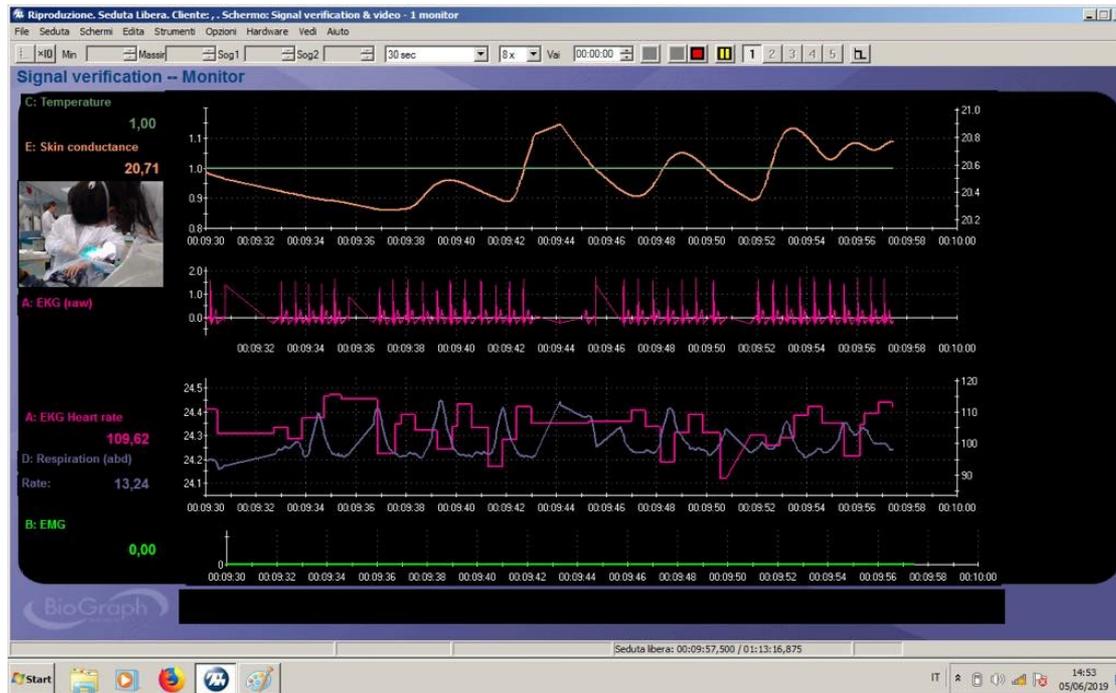
Experimental protocol

Electrodes attachment



Experimental protocol

Recovery physiological assessment (3 min) and VAS



BREATHING WITH AMPLITUDE



79 Beats/minute

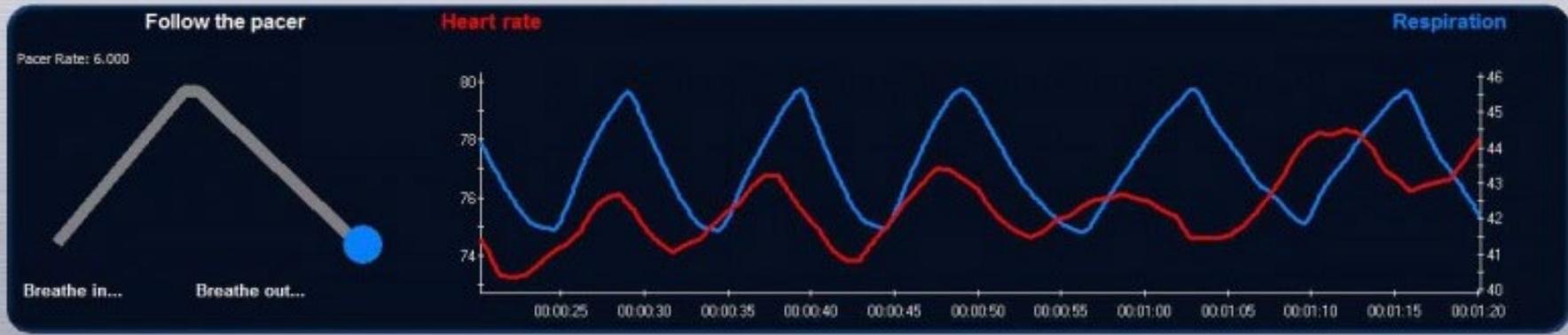


4.7 Breaths/minute



27 Success points

Reach the goal! Variability (HR max-min): 4.6



Results: correlations

Social anxiety subscale of the MASC with:

- baseline levels of **fear** ($r = .78$; $p = .002$)

Harm avoidance subscale of the MASC with:

- baseline levels of **anger** ($r = .48$; $p = .033$)
- **sadness** ($r = .52$; $p = .018$)

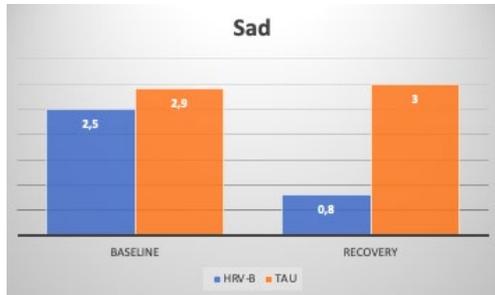
Rumination subscale of the CRSQ with:

- baseline levels of **fear** ($r = .52$; $p = .019$)

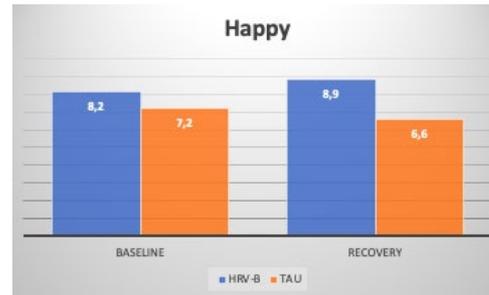
HF-HRV at baseline negatively with

- **social anxiety** subscale scores of the MASC ($r = -.50$; $p = .029$)
- **rumination** subscale of the CRSQ ($r = -.51$; $p = .026$).

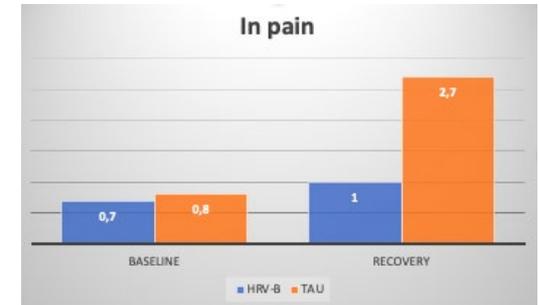
Results



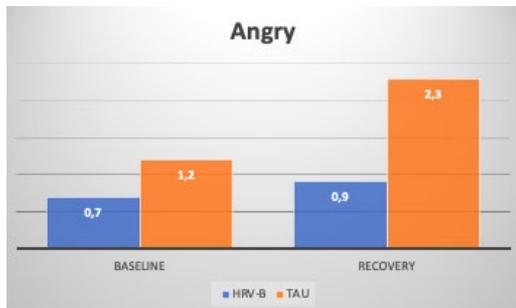
HRV-B pre vs post: $p = .041$; $d = 0.73$



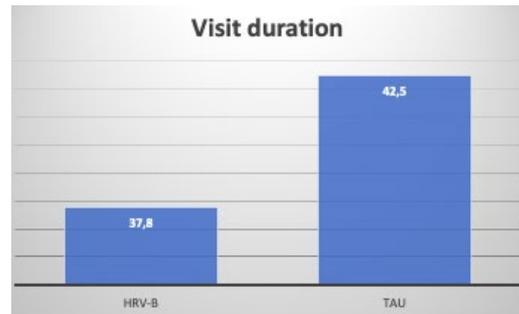
n.s.



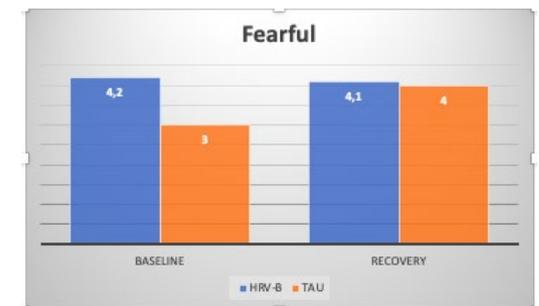
TAU pre vs post: $p = .03$; $d = 0.80$



TAU pre vs post: $p = .09$; $d = 0.45$

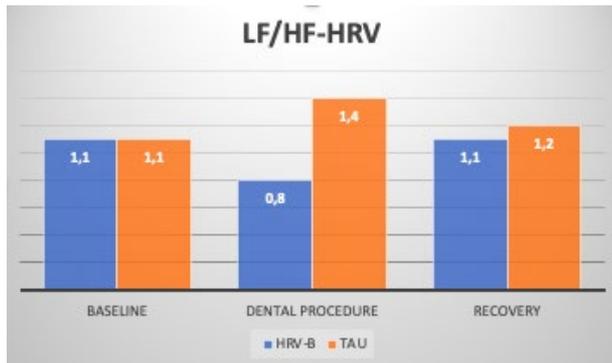


$p < .0001$; $d = 0.21$



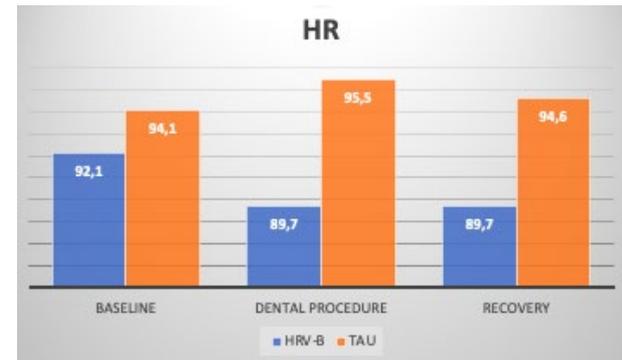
TAU pre vs post: $p = .044$; $d = 0.28$

Time X Condition,
 $F_{2,36} = 7.11; p = .002, \eta_p^2 = .27$

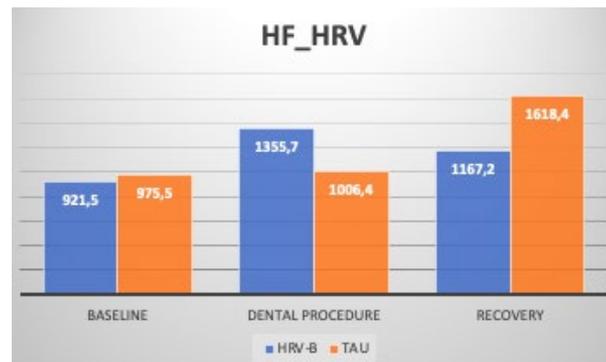


**reduction from baseline to
the dental procedure in the
HRV-B group only
($d = 0.59$)**

Time X Condition,
 $F_{2,36} = 3.07; p = .058, \eta_p^2 = .14$



**HR decrease in the HRV-B
group ($d = 0.19$)
HR increase in the TAU group
($d = 0.10$)**



Discussion



HRV-B is promising intervention to

- a) **enhance physiological relaxation** (as indexed by decreased HR and LF/HF);
- b) **decrease self-reported levels of pain;**
- c) **increase subjective well-being** in children undergoing dental treatment.
- d) **reduce the duration of the dental intervention**, likely due to **increased cooperative behaviour**

Role of dispositional factors (social anxiety, tendency to engage in depressive rumination, and harm avoidance) useful **early identification of the vulnerable children**, who would benefit the most from HRV-B training before a dentist appointment.

Conclusions

Main **limitation** concerns the examined **sample size**.

The **major strength** is its **ecological validity**, as the study was conducted in a real workplace environment, and not in an experimental setting such as a laboratory.

Investigations into the application of promising treatments would require a **multidisciplinary approach**, involving both experts in **psychological interventions** to anxiety disorders in youth and specialists in **paediatric dentistry**.

THANK YOU FOR YOUR ATTENTION!

