

Psychological Distress among Young People: The moderating role of heart rate variability in the relationship with maladaptive metacognitions

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INTRODUCTION

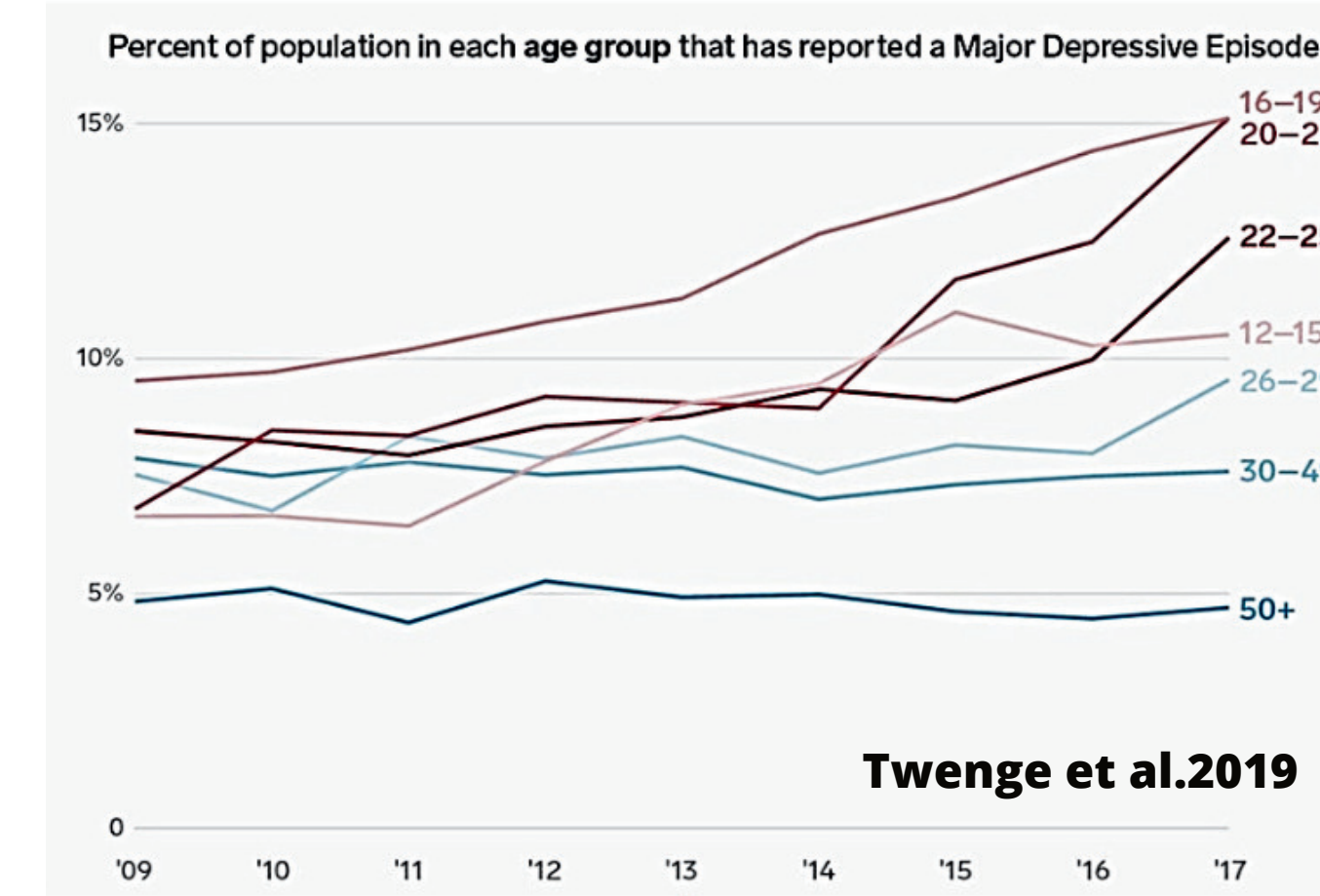
The rising rates of psychological distress among young people (Barker et al., 2019; Twenge et al., 2019) emphasize the urgency of identifying factors for early detection, prevention, and effective treatment.

Prior research has consistently associated psychological distress with maladaptive metacognitions, a form of cognitive inflexibility (Wells & Matthews, 1996). More recently, there has been a focus on the connection between psychological distress and heart rate variability (HRV), a psychophysiological measure of self-regulation (Kemp et al., 2010). Low HRV is linked to autonomic inflexibility and symptoms of anxiety and depression, while high HRV has been linked to an increased capacity to adapt to environmental requests in a flexible manner (Thayer et al., 2012).

It has been proposed that there may be a cognitive-autonomic nexus linking cognitive inflexibility and autonomic inflexibility (Ottaviani, 2018). However, there are few studies that have actually investigated how this nexus may relate to psychological distress.

Objectives:

- Investigate the potential roles of maladaptive metacognitions and high resting HRV as psychological vulnerability and protective factors, respectively.
- Explore whether resting HRV moderates the relationship between metacognitions and psychological distress symptoms.



METHOD

Participants: Forty young adults (35 females, M age = 22.25, SD = 1,33)

Self-report measures:

- Maladaptive metacognitions:** *Metacognitions Questionnaire (MCQ-30)*; subscales: cognitive confidence (CC), cognitive self-consciousness (CSC), positive beliefs about worry (POS), negative beliefs about worry (NEG), beliefs about the need to control thoughts (NC))
- Psychological distress:** *Depression Anxiety-Stress Scale (DASS-21)*; total score)

Autonomic measure: HRV: Root mean square of the successive differences in the interbeat intervals (rMSSD)

Procedure

- Participants underwent EKG for 5 minutes at rest
- Participants completed the MCQ-30 and the DASS-21

HRV analysis: rMSSD was calculated over the central 3 minutes in the 5-min recording at rest using Kubios HRV Analysis Software 2.0.

Data analysis:

- Multiple regression analysis** (maximum likelihood method) to study the relative contributions of HRV (i.e., rMSSD) and maladaptive metacognitions (i.e., MCQ-30 subscales) to psychological distress (i.e., DASS-21 total score) + the possible moderating effect of HRV (i.e., the interactions of rMSSD with MCQ-30 subscales)
- Slope analysis** to further study statistically significant interactions

RESULTS

DV = DASS_TOT

	df	β	F	p		df	β	F	p
RMSSD	1	-0.106	0.0010	0.975	RMSSD:POS	1	0.202	0.0107	0.918
POS	1	0.052	16.3714	<.001***	RMSSD:NEG	1	0.283	0.2681	0.609
NEG	1	0.468	26.2302	<.001***	RMSSD:CC	1	0.201	0.0135	0.908
CC	1	0.291	2.1581	0.155	RMSSD:NC	1	0.142	1.6228	0.215
NC	1	0.041	0.0920	0.764	RMSSD:CSC	1	0.059	6.6332	0.016*
CSC	1	0.177	1.0070	0.326					

Table 1. Multiple regression analysis for assessing (A) the relationships between psychological distress (DASS_TOT, the dependent variable [DV]), HRV (rMSSD), maladaptive metacognitions (MCQ-30 subscales) (B) the moderating effects of HRV (rMSSD) on the relationship between psychological distress (the DV) and maladaptive metacognitions

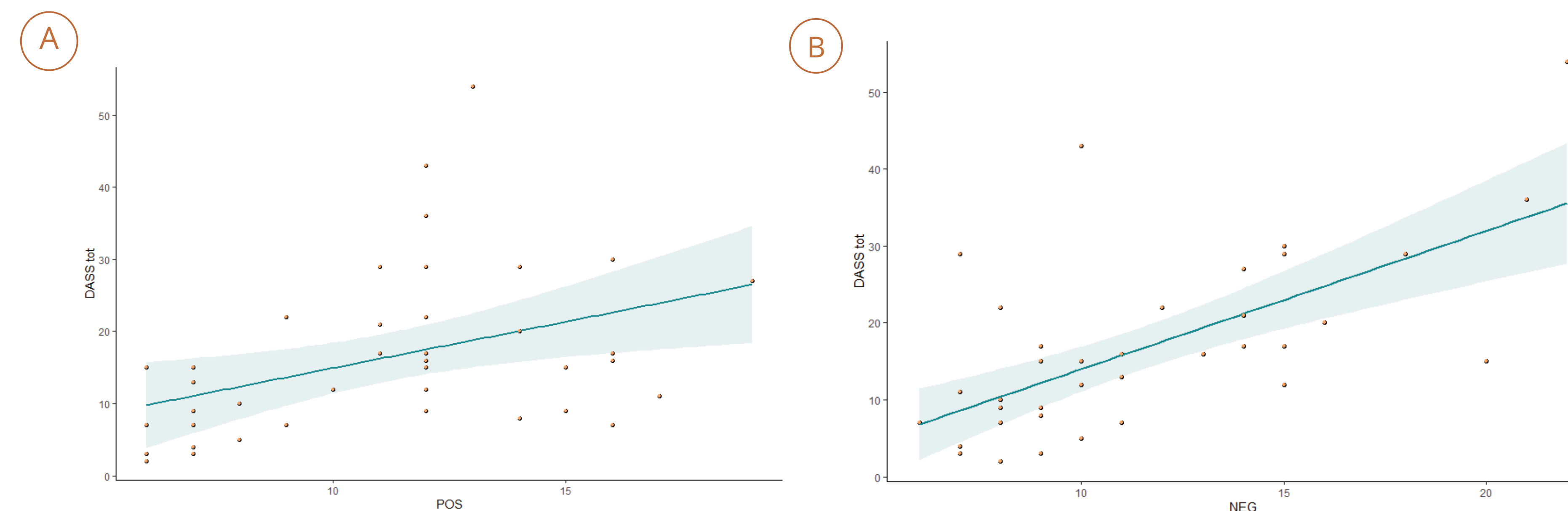


Figure 1. (A) Positive relationship between psychological distress (DASS_TOT) and positive beliefs about worry (POS) (B) Positive relationship between psychological distress (DASS_TOT) and negative beliefs about worry (NEG)

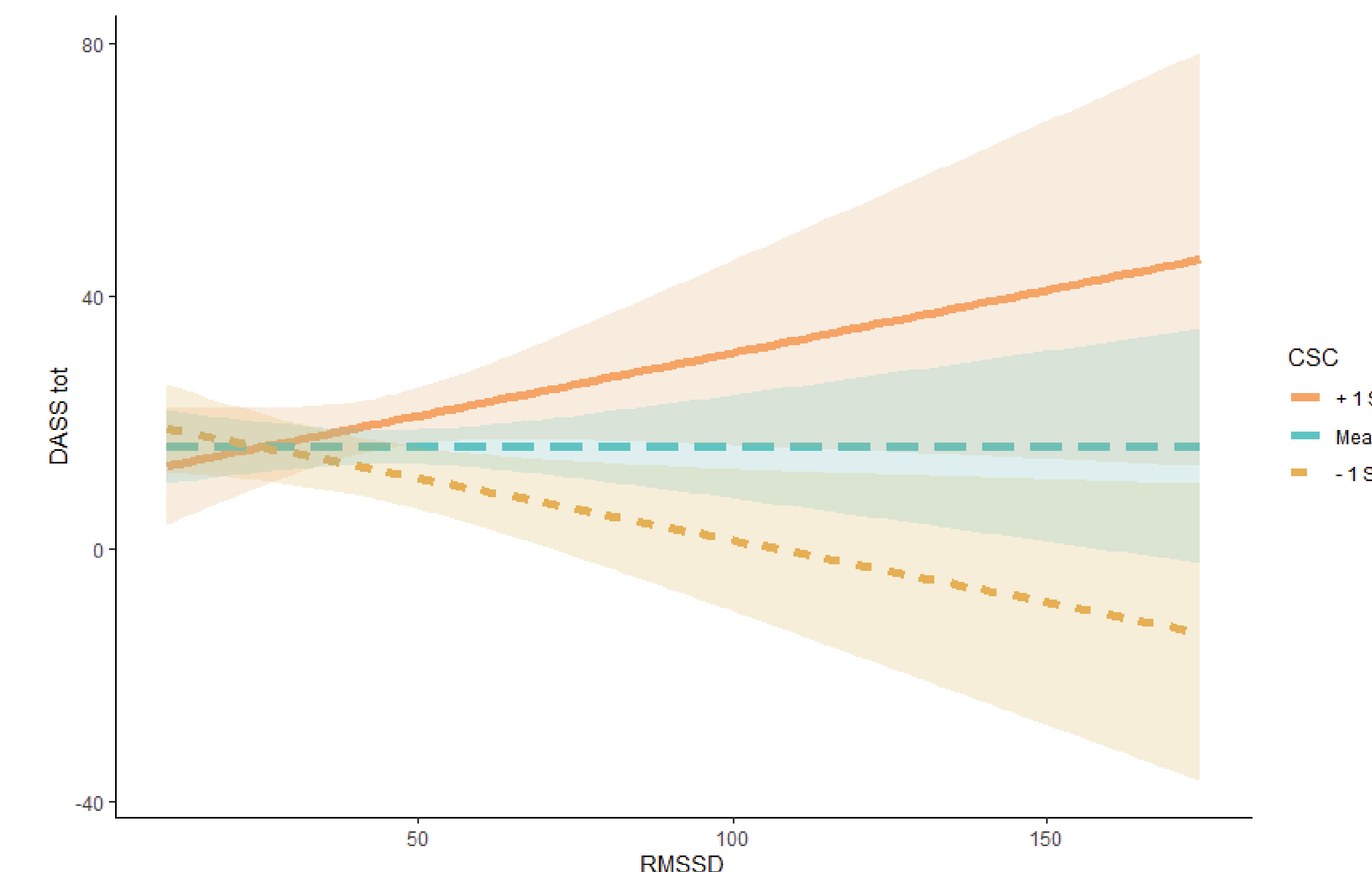


Figure 2. Moderating effect of HRV (RMSSD) on the relationship between psychological distress (DASS_TOT) and cognitive self-consciousness (CSC)

- Main effect of POS subscale** ($F(1,23) = 16.37, \beta = 0.05, p = <.001$)
- Main effect of NEG subscale** ($F(1,23) = 26.23, \beta = 0.46, p = <.001$)
- Interaction effect between rMSSD and CSC subscale** ($F(1,23) = 6.63, \beta = 0.05, p = 0.01$)
- Post-hoc slope analysis revealed that for the low scorers in the CSC subscale, lower psychological distress was associated with higher HRV at rest ($\beta = -0.20 \pm 0.08$)

DISCUSSION

- Individuals with higher meta-beliefs about the positivity of rumination or the dangerousness and uncontrollability of worry show higher levels of psychological distress.**

This result is in line with the literature that has highlighted worry and rumination as core cognitive processes in generalized anxiety disorder and major depressive disorder (Davey & Wells, 2006; Wells & Carter, 2001).

→ Maladaptive metacognitions may be used as indices for the early identification of individuals at risk of developing anxiety and depressive disorders

- In individuals with a lower tendency to monitor their thoughts, lower levels of psychological distress are associated with higher HRV at rest.**

1. This result is in line with the literature suggesting that higher HRV at rest may be a protective factor against psychological distress and associated disorders (Utsey & Hook, 2007; Thayer et al., 2012; Makovac et al., 2022).

2. This result suggests that greater emotional regulation capacity associated with higher HRV may be reflected in reduced maladaptive self-monitoring.

3. This result supports the existence of a link between cognitive flexibility and autonomic flexibility (Ottaviani, 2018).

→ The increase in HRV at rest could be used as a target for preventive interventions aimed at improving cognitive flexibility.

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