

Associations between Different Facets of Anhedonia and Neural Response to Monetary, Social, and Food Reward in Emerging Adults



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INTRODUCTION

- The reward positivity (RewP) is a positive deflection in the event-related potential (ERP) that indexes reward sensitivity
- A **blunted** RewP has been associated with depression and **anhedonia**, the inability to derive pleasure from rewards
- Most of the literature has investigated the RewP using **monetary rewards**
- It is unclear whether anhedonia reflects **domain-general** (the same across all reward incentive types) or **category-specific** (different across different incentive types) deficits in neural response to rewards

We investigated associations between the RewP elicited by **monetary, social, and food reward** and self-report measures of **reward sensitivity**.

METHODS

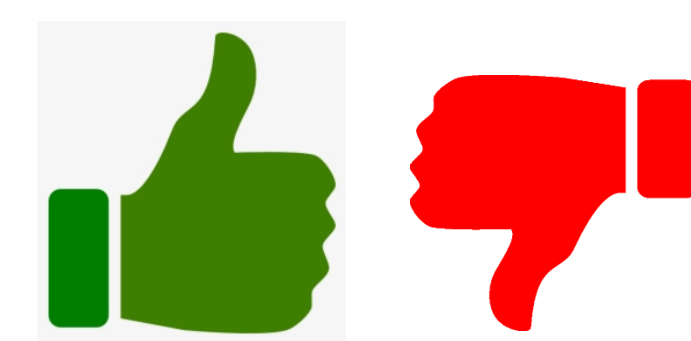
Participants:

- 120 emerging adult females (Mean age = 20.67, SD = 2.16)

Measures:

- "Anhedonic depression" subscale of the Mood and Anxiety Symptoms Questionnaire (MASQ-D30; Wardenaar, van Veen, Giltay, Penninx, & Zitman, 2010)
- The Temporal Experience of Pleasure Scale (TEPS; Gard, Gard, Kring, & John, 2006)
- The Reward Responsiveness Scale (RR; Van den Berg, Franken, & Muris, 2010)
- The Revised Social Anhedonia Scale – Short Form (RSAS-SF; Winterstein et al., 2011)

Tasks: **Doors task** (Proudfit, 2015) **Plates task** (Banica et al., 2020) **Island Getaway task** (Kujawa, Arfer, et al., 2014)

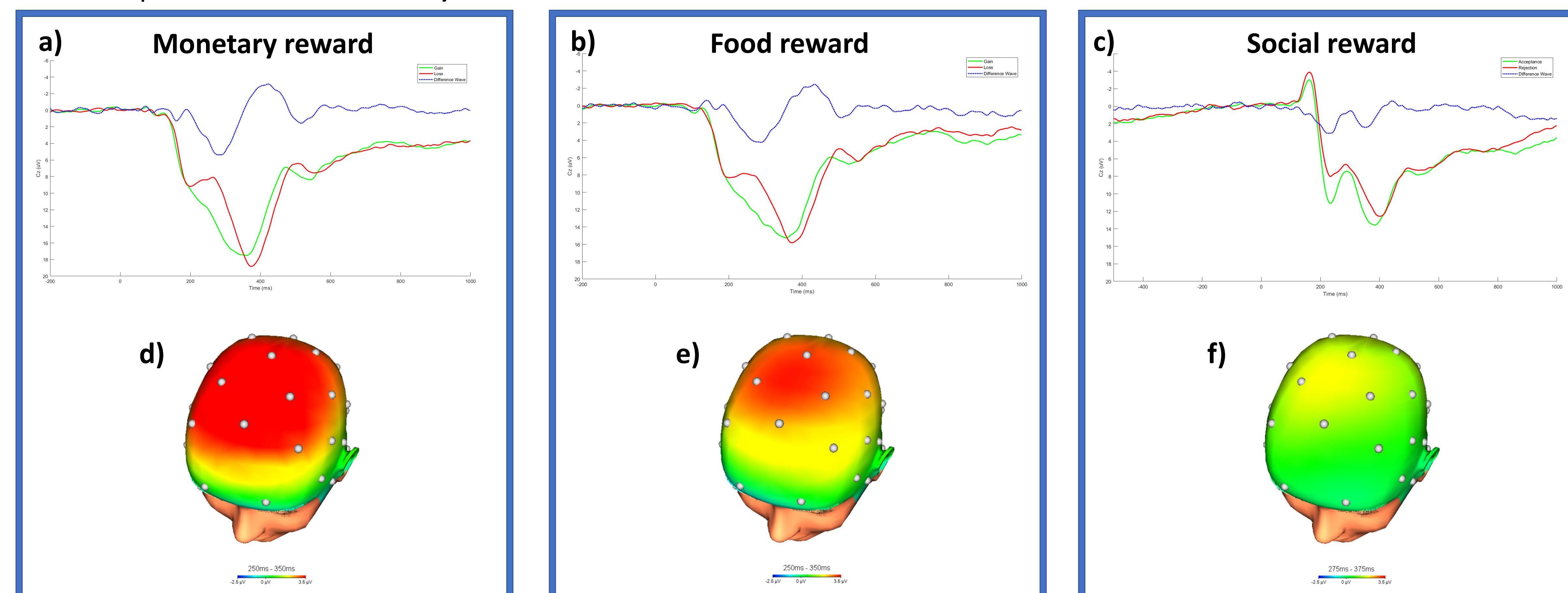


EEG recording and analysis:

- 32-electrode cap and BrainVision actiChamp system (Brain Products, Munich, Germany)
- Monetary and food RewP scored as average activity on reward trials from 250 to 350 ms at electrode site Cz
- Social RewP scored as average activity on acceptance trials from 275 to 375 ms at Cz
- A regression-based procedure was used to generate residual RewP (RewP_{resid}) scores by controlling for average activity on loss trials from 250 to 350 ms at Cz for monetary and food RewP values, and average activity on rejection trials from 275 to 375 ms at Cz for social RewP values

RESULTS

Figure 1. Response-locked ERP average waveforms following gain and loss, as well as the gain minus loss difference wave, at electrode Cz for **a) monetary, b) food, and c) social reward**. Topographic map depicting the average difference (μ V) between gain and loss responses from 250 ms to 350 ms post-stimulus onset for **d) monetary and e) food reward**, and from 275 ms to 375 ms post-stimulus onset for **f) social reward**.



RESULTS

Table 1. Bivariate correlations between self-report and neural reward measures.

	1.	2.	3.	4.	5.	6.	7.	Mean	SD	Range
1. Monetary RewP _{resid}								0	1	-2.55 to 2.41
2. Food RewP _{resid}	.26**							0	1	-2.04 to 3.04
3. Social RewP _{resid}	.17†	.04						0	1	-2.95 to 3.11
4. Anhedonic depression	-.05	-.05	-.14					30.08	8.32	13 to 49
5. Anticipatory pleasure	-.12	.08	.12	-.34**				44.71	7.67	22 to 60
6. Consummatory pleasure	-.09	.19*	.03	-.17†	.49**			38.57	5.90	19 to 48
7. Reward responsiveness	-.04	.08	-.05	-.30**	.52**	.30**		25.60	3.40	14 to 32
8. Social anhedonia	-.01	-.01	-.19*	0.27**	-.15	-.10	-.07	2.51	2.44	0 to 12

Note. RewP_{resid} = residual reward positivity. ** = $p < .01$; * = $p < .05$; † = $p < .08$.

Figure 2. **a)** Correlations between monetary and food RewP values. **b)** Correlations between monetary and social RewP values. **c)** Correlations between social and food RewP values.

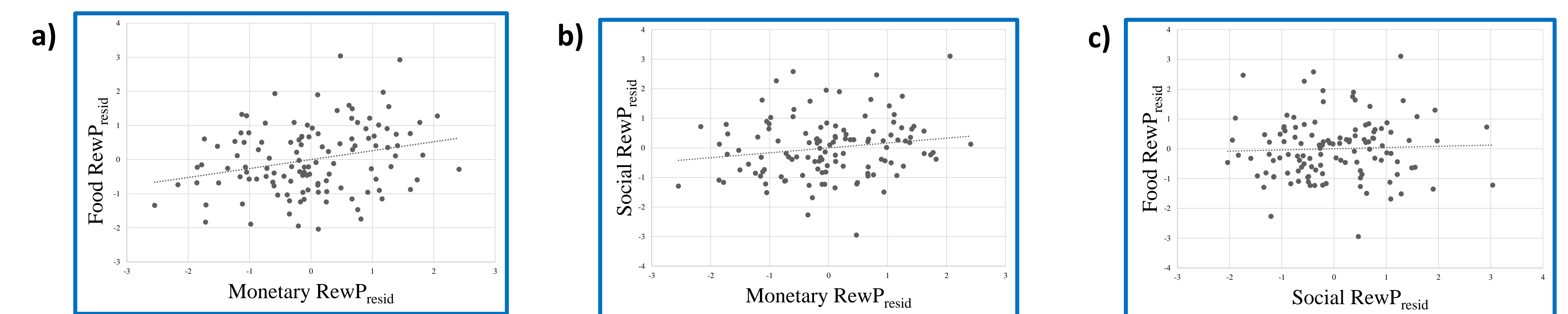


Table 2. Results of a simultaneous linear regression predicting social anhedonia from the RewP variables.

Predictor	B (SE)	β	p	95% CI
Monetary RewP _{resid}	0.06 (0.23)	0.02	0.81	-0.41, 0.52
Food RewP _{resid}	-0.01 (0.23)	-0.01	0.96	-0.47, 0.45
Social RewP _{resid}	-0.48 (0.23)	-0.20	0.04	-0.93, -0.03

Total $R^2 = 0.04$, $F(3, 115) = 1.49$, $p = 0.22$

Table 3. Results of a simultaneous linear regression predicting consummatory pleasure from the RewP variables.

Predictor	B (SE)	β	p	95% CI
Monetary RewP _{resid}	-0.92 (0.56)	-0.16	0.11	-2.03, 0.19
Food RewP _{resid}	1.37 (0.56)	0.23	0.02	0.26, 2.47
Social RewP _{resid}	0.26 (0.54)	0.04	0.64	-0.82, 1.33

Total $R^2 = 0.06$, $F(3, 115) = 2.41$, $p = 0.07$

DISCUSSION

- Monetary RewP values are positively correlated with food and social RewP values
- Food and social RewP values are not significantly correlated with one another
- Symptoms of social anhedonia are uniquely and significantly associated with social RewP values
 - Individuals with a smaller social RewP report heightened social anhedonia sx
- Self-report of consummatory pleasure is uniquely and significantly associated with food RewP values
 - Individuals with a larger RewP to food reward report greater "liking" when consuming rewards

There appear to be **domain-general** and **category-specific** aspects to reward processing. Distinct neural reward processing pathways may be involved in specific dimensions of anhedonia.

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