

Letters

COMMENT & RESPONSE

In Reply Van Holst et al provide a thoughtful comment on our meta-analysis of functional magnetic resonance imaging studies investigating reward processing in addiction.¹ Their letter mainly focuses on 2 methodological points.

First, van Holst et al highlight that the tasks used in gambling disorder (GD) studies are less homogeneous than those in substance use disorder (SUD) studies. Although this is correct—and reflects fewer studies available on GD—we believe that contrast homogeneity, rather than task homogeneity, is what primarily matters. In keeping with this, we carefully selected those contrasts that capture the 2 cognitive processes of interest in our meta-analysis, namely monetary reward anticipation and outcome. Incidentally, this is the reason why some of these contrasts depart from those reported in the original articles. It is worth emphasizing that heterogeneity is a pervasive problem in (neuroimaging) meta-analyses that extends beyond tasks and includes heterogeneity in design efficiency, data analysis, and population selection. However, task heterogeneity is not necessarily detrimental, as the convergence of activations despite such heterogeneity ensures that the results are not due to idiosyncrasies in task design and are generalizable across a variety of paradigms.²

Second, as van Holst et al correctly point out, the SUD and GD populations were not directly compared. The main reason is that these populations originated from different studies and were thus unlikely to be matched. In addition, our rationale for including both SUD and GD studies was the search for similarities, rather than differences, in brain activations. As a result, we agree with van Holst et al that differences uncovered by our meta-analysis between brain maps for SUD and GD studies are inherently qualitative and should be interpreted with caution.

Yet, it is of crucial relevance to explore neurobiological similarities and differences between behavioral addictions, such as GD, and substance addictions because this can shed light on several highly debated issues. First, there is a growing number of problematic behaviors being regarded as potential behavioral addictions including problematic internet use, binge eating, compulsive buying, and compulsive sexual activities.³ Accordingly, in the *DSM-5*, a chapter on substance use and addictive disorders was included containing GD as a behavioral addiction and internet gaming disorder as a “con-

dition for further study.” Unraveling the neural mechanisms underlying these problematic behaviors could help refine the boundaries and definition of behavioral addictions. Second, substance and behavioral addictions have partly similar diagnostic characteristics, such as craving, diminished behavioral control, tolerance, and withdrawal-like symptoms. It is unclear whether this homogeneity in symptoms also reflects shared neurobiological mechanisms. This question is clinically relevant, as treatment approaches for SUD are currently adapted and applied to behavioral addictions including GD.^{4,5} Neuroimaging studies could shed light on the sensibility of such an approach and could potentially guide future treatment development for substance and behavioral addictions.

In conclusion, we fully agree with van Holst et al that more studies investigating reward processing in behavioral addictions are needed to further advance our understanding of shared and distinct neural mechanisms contributing to SUD and behavioral addictions.

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