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# Comparison of prevalences since the pandemic may not be relevant!

## Caution is advised with prevalence comparisons: The Case of Psychological Distress with Students and COVID in France, a Network Approach

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## Introduction

The Covid pandemic has motivated many studies to measure its psychological impact, especially among students.<sup>1,2,3</sup> However, it is important to ensure that the measured constructs are comparable (measurement invariance); otherwise, the comparison of total scores or prevalences is biased<sup>4,5</sup>. We propose to use the network approach<sup>6</sup> to model, assess and compare psychological distress in a way that circumvents the problem of measurement non-invariance while informing the potential psychological impact of the pandemic among students. Finally, based on post-pandemic networks, we used simulation techniques to identify the most relevant intervention and prevention targets<sup>7</sup>.

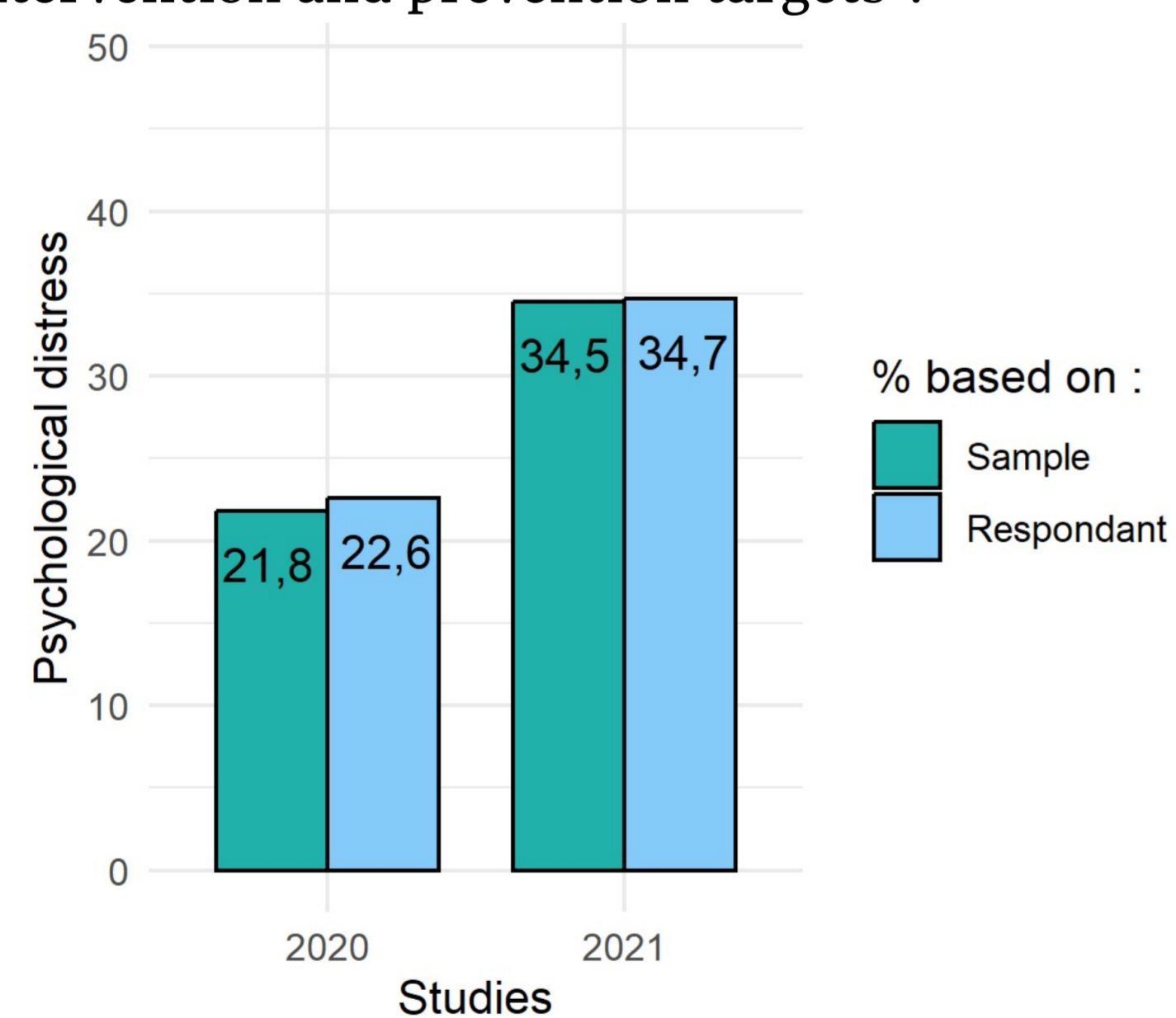


Figure 1: Changes in psychological distress between 2020 and 2021

## Methods

OVE surveys measured Psychological Distress in nationally representative French student samples, over the last 2 weeks, in 2020 (n=60,014) and 2021 (n=4,901) using the MHI-5<sup>8</sup>. Measurement Invariance (latent modeling with ordinal indicators)<sup>9</sup>, Network Modeling (GGM, corMethod=spearman)<sup>10,11</sup>, Network Comparison Tests (NCT with GGM)<sup>12</sup>, and simulations (NIRA method with Ising Model)<sup>7</sup> were performed with R software.

## Results

### Measurement invariance

There is a maximum difference of 12.7% in the prevalence of Psychological Distress between 2020 and 2021 based on sum score indicators (Figure 1). However, measurement invariance in a latent framework is only partial after correction (Figure 2).

Comparison	Weak <sup>1</sup>	Strong <sup>2</sup>	Strict <sup>3</sup>	Partial <sup>4</sup>
2020 - 2021	Partial	Partial	No	Loadings : D & T   Intercepts : T, D & H

<sup>1</sup> Weak -> Loadings equals  
<sup>2</sup> Strong -> Loading + Intercepts equals  
<sup>3</sup> Strict -> Loadings + Intercepts + Residuals equals  
<sup>4</sup> Equality constraints removed between groups  
N = Nervous ; S = Sad ; C = Calm ; H = Happy ; D = Discouraged

Figure 2: Measurement invariance between 2020 and 2021

### Network comparisons

For networks, if the results were not conclusive for global connectivity, however, changes were observed for the global network structure and for edge strength, specifically the relationship between nervousness - sadness / nervousness - discouragement / nervousness - happy / discouragement - calm (Figure 3).

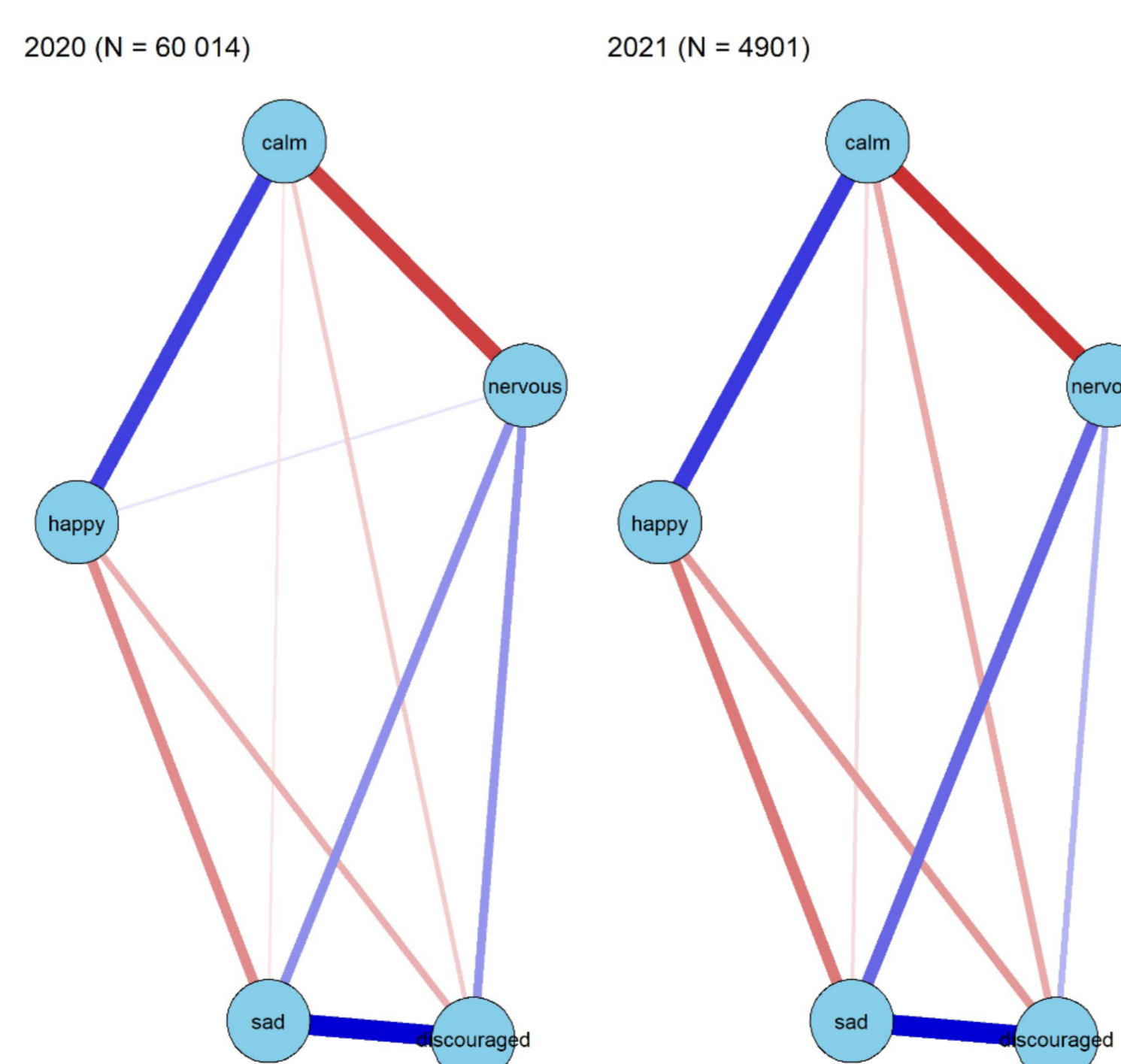


Figure 3: Networks graphs from 2020 and 2021

## Simulations

Simulations (NIRA method) identified nervousness as the most effective intervention target for Psychological Distress, while discouragement is more relevant to prevent the system from transitioning to a "pathological" state (Figures 4).

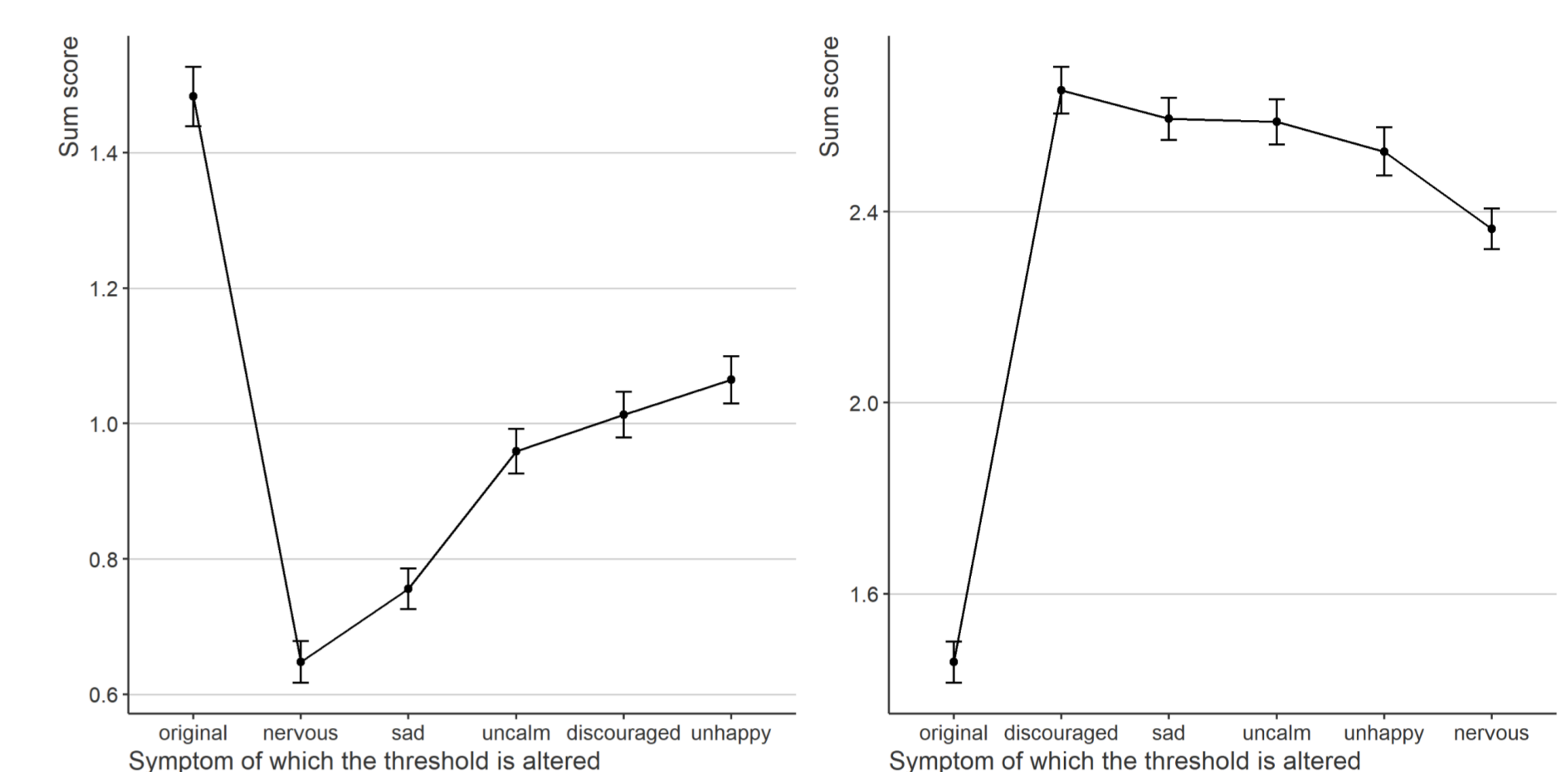


Figure 4: Alleviating (left) and Aggravating (right) simulations for 2021 network

## Limits and conclusion

We must remain cautious with the results of surveys that compare prevalences when measurement invariance is not established<sup>13</sup>. Indeed, confusion remains between 1) an increase in prevalence linked to a worsening of the situation and/or 2) a different way of answering questions due to contextual effects. Using network modeling makes it possible to represent the system's evolution without resorting to prevalence comparisons, which would imply measurement invariance. However, and regardless of the chosen modeling technique, without qualitative data or cognitive interviews, it is difficult to gain information regarding the confusion mentioned above.

Simulation techniques make it possible to identify how the system would behave in a given context and with a given intervention, thus opening the way to more targeted interventions. However, the generalist approach used here captures only a global trend that is difficult to apply to each individual<sup>14</sup>. Finally, psychotherapeutic interventions cannot target a symptom in isolation<sup>15</sup>, but rather a set of processes in complex interactions, confirming the choice of complex systems-based modeling techniques<sup>16-18</sup>.

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