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Anxiety sensitivity predicts depression severity in individuals with dissociative identity disorder

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ABSTRACT

Background: Anxiety sensitivity involves the fear of anxiety-related symptoms and can exacerbate both major depressive disorder and posttraumatic stress disorder (PTSD) symptoms. However, it is unclear if anxiety sensitivity plays a similar role in dissociative identity disorder (DID) where symptoms of depression and PTSD commonly co-occur. We examined the association between anxiety sensitivity, depression, PTSD and dissociative symptoms in DID, hypothesizing a positive association between all symptoms and anxiety sensitivity.

Method: Participants were 21 treatment-seeking adult females with histories of childhood trauma, current PTSD, and DID. Participants completed the Anxiety Sensitivity Index (ASI), Beck Depression Inventory-II, Childhood Trauma Questionnaire, Multidimensional Inventory of Dissociation, and PTSD Checklist for DSM-5. The ASI included subscales that assessed anxiety sensitivity in cognitive, physical, and social domains.

Results: Participants reported high levels of anxiety sensitivity. A multiple regression analysis demonstrated that the ASI cognitive subscale was the strongest predictor of depressive symptoms. No direct associations were identified between anxiety sensitivity and PTSD or dissociative symptoms. We conducted a mediation analysis to test an indirect relationship between cognitive anxiety sensitivity and dissociative symptoms, and found a significant indirect effect through depressive symptoms.

Conclusions: Our results suggest that cognitive anxiety sensitivity or the fear of cognitive dyscontrol is linked with symptom severity in DID. These findings emphasize the need to assess for and utilize interventions that target anxiety sensitivity, which may in turn alleviate symptoms of depression and dissociation in DID.

1. Introduction

Anxiety sensitivity is the fear of anxiety signs and symptoms based on the belief that they may have harmful consequences (Peterson and Reiss 1993). It can occur in cognitive, physical and social contexts: (a) fear of losing control of one's cognitive functioning (e.g., scared of feeling you cannot focus because you believe it signals mental illness), (b) fear of physical sensations (e.g., fear of racing heart beats because you believe these sensations may lead to a heart attack), and (c) fear of having anxiety reactions in public settings (e.g., fear that sweating hands will cause you embarrassment) (Taylor and Cox 1998). Anxiety sensitivity is strongly associated with the occurrence of panic attacks (Taylor et al., 1992) and can contribute to the worsening of symptoms across anxiety disorders (Taylor et al., 1992), depressive disorders (Taylor et al., 1996), and trauma- and stressor-related disorders including PTSD (Nixon and Bryant, 2006; Taylor 2003). Moreover, interventions for anxiety sensitivity have been shown to improve treatment outcomes (Taylor 2003; Fedroff et al., 2000). Despite the prior work, anxiety sensitivity has not been studied in individuals with complex dissociative disorders such as dissociative identity disorder (DID), who often have co-occurring posttraumatic stress disorder (PTSD) and depression (Dorahy et al., 2014; Loewenstein 2018). Understanding the role of anxiety sensitivity in DID may help identify individuals who are at risk of higher symptom severity and may plausibly improve assessments and interventions.

1.1. Anxiety sensitivity, depression and PTSD

Anxiety sensitivity plays a role in the severity and persistence of major depressive disorder. The link between anxiety sensitivity and depression is driven by anxiety sensitivity in the cognitive domain,

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rather than the physical or social concerns (Taylor et al., 1996; Cox et al., 2001; Saulnier et al., 2018; Rector et al., 2007). Anxiety sensitivity in the cognitive domain can also be thought of as the fear of cognitive dyscontrol, and can manifest in the following way: individuals may believe that depressive symptoms, such as indecisiveness and decreased ability to think or concentrate, are indicative of a loss in cognitive capacity and mental health. These concerns cause anxiety, demoralization, and hopelessness, all of which contribute to worsening depressive symptoms (Taylor et al., 1996).

Likewise, individuals with PTSD report some of the highest levels of anxiety sensitivity even when compared to those with anxiety disorders (Taylor 2003). Moreover, higher levels of anxiety sensitivity, particularly in physical and cognitive domains, predict the severity of PTSD symptoms (Taylor et al. 2003; Fedroff et al., 2000; Marshall et al., 2010; Asmundson and Stapleton 2008; Lang et al., 2002). Research suggests individuals with PTSD and high levels of anxiety sensitivity may believe PTSD symptoms will negatively impact their health and social functioning, which can in turn exacerbate PTSD symptoms (Fedroff et al., 2000). Following treatment, reductions in anxiety sensitivity were associated with reductions in PTSD symptoms (Fedroff et al., 2000).

1.2. Anxiety sensitivity and dissociation

The relationship between dissociation, "a disruption and/or discontinuity in the normal integration of consciousness, memory, identity, emotion, perception, body representation, motor control, and behavior" (American Psychiatric Association et al., 2013, p.291), and anxiety sensitivity has received little attention to date. Two studies have linked dissociation and anxiety sensitivity in acute stress disorder and borderline personality disorder. Nixon and Bryant (2006) found that anxiety sensitivity about physical symptoms predicted peritraumatic dissociative reactions in acute stress disorder. In particular, they concluded that the tendency to interpret somatic sensations as harmful may contribute to arousal-induced dissociation. Demirkol et al. (2020) found that in borderline personality disorder, the physical, cognitive, and social subdimensions of anxiety sensitivity all affected dissociative experiences; however, the cognitive subdimension had the greatest impact on dissociation. These studies provide initial evidence of a relationship between anxiety sensitivity and dissociation, especially in the physical and cognitive domains.

Despite this evidence, no previous research has examined anxiety sensitivity in dissociative disorders, which are predominated by severe dissociative symptoms (APA, 2013). Dissociative identity disorder (DID) is a developmental posttraumatic syndrome associated with the experience of chronic and severe childhood maltreatment (Putnam 2016). The core experience in DID is a disruption in one's sense of self in which one's thoughts, feelings, bodily sensations, and behaviors can feel as though they do not belong to the person (American Psychiatric Association et al., 2013; Putnam 2016). Without the sense of self-ownership, such experiences are then perceived as unexpected, "jarring intrusions into executive functioning" (Dell, 2006a,b). Furthermore, individuals with DID are likely to have co-occurring disorders, with PTSD, major depressive disorder and persistent depressive disorder being the most common comorbidities (Dorahy et al., 2014; Loewenstein 2018). Given that prior work connects anxiety sensitivity to increased severity of PTSD, depression, and dissociative symptoms in other clinical samples, anxiety sensitivity may also exacerbate symptoms in DID, though this remains untested.

To address this gap, we examined the association between anxiety sensitivity and common symptoms in DID including PTSD, depressive, and dissociative symptoms. We hypothesized that individuals with DID would report high levels of anxiety sensitivity, and that anxiety sensitivity would predict higher levels of all three symptom types.

2. Materials and methods

2.1. Participants

The study included 21 treatment-seeking adult females who were receiving inpatient, residential, and partial hospital care at a free-standing psychiatric hospital in the northeastern United States. All participants had histories of childhood trauma, and met criteria for PTSD and DID based on the Clinician Administered PTSD Scale for DSM 5 (CAPS-5; Weathers et al., 2018) and the Structured Clinical Interview for DSM-IV-R Dissociative Disorders (SCID-D; Steinberg 1994), respectively. Diagnostic interviews were conducted by trained research staff. The final diagnosis was determined by a psychiatrist who specializes in trauma and dissociative disorders. The demographic and clinical characteristics of the participants are summarized in Tables 1 and 2.

2.2. Measures

Anxiety Sensitivity Index (ASI; Peterson and Reiss 1993; Reiss and Mcnally, 1985). The ASI is a 16-item measure designed to assess fear of anxiety signs and symptoms based on the belief that they may have harmful consequences. Participants are asked to rate their anxiety sensitivity on a 5-point Likert scale ranging from "agree very little" (0) to "agree very much" (4). Previous research (Taylor and Cox 1998; Zinbarg et al., 1997) has identified three subscales: (a) cognitive concerns (e.g., "I might lose control of my mind"); (b) physical concerns (e.g., "It scares me when my heart beats rapidly"); (c) social concerns (e.g., "It is important for me not to appear nervous"). The ASI has demonstrated good internal consistency and reliability (Peterson and Heilbronner 1987; Stewart et al., 1997; Zvolensky et al., 2001). Previous work has identified various cut-off scores to categorize individuals as having a high or low level of anxiety sensitivity using the ASI. Some studies use 22 and 8 as high and low anxiety sensitivity cutoffs, respectively (Keogh and Cochrane, 2002; Keogh and Birkby, 1999; Keogh and Mansoor, 2001). Other work identified individuals with a score over 24 as having high anxiety sensitivity and those who had a score below 14 as having low anxiety sensitivity (Barnard et al., 2011; Broman-Fulks et al., 2004). Additionally, Jurin and Biglbauer (2018) proposed a high anxiety sensitivity cutoff score of 25. In our study, we used the most conservative cut-off scores: below 8 for "low anxiety sensitivity" and above 25 for "high anxiety sensitivity."

Beck Depression Inventory-II (BDI-II; Beck et al., 1996). The BDI-II is a 21-item self-report questionnaire that measures depressive

Table 1
Participant demographics.

Age, mean ± SD	42.48 ± 12.83
Sex assigned at birth, N (%)	
Female	21 (100%)
Gender, N (%)	
Female	19 (90.5%)
Missing	2 (9.5%)
Race, N (%)	
Black/African-American	1 (4.8%)
White	20 (95.2%)
Ethnicity, N (%)	
Non-Hispanic/Non-Latinx	19 (90.5%)
Other - Unknown	1 (4.75%)
Greek Orthodox	1 (4.75%)
Education, N (%)	
Grade 7 to 12 (without graduating high school)	1 (4.8%)
Part college	5 (23.8%)
Graduated 2-year college	1 (4.8%)
Graduated 4-year college	3 (14.3%)
Part graduate/professional school	2 (9.5%)
Completed graduate/professional school	7 (33.3%)
Missing	2 (9.5%)

Note: N = 21.

Table 2
Clinical characteristics.

Diagnoses	N (%)	
DID	21 (100%)	
PTSD Dissociative subtype	21 (100%)	
Dimensional Symptoms	**Mean±SD**	**Range**
ASI Total Score	37.43 ± 12.89	14–64
ASI Cognitive Concerns	8.43 ± 4.13	0–16
ASI Physical Concerns	17.52 ± 7.92	1–32
ASI Social Concerns	11.48 ± 2.5	7–16
Beck Depression Inventory II Total Score	30.33 ± 14.07	7–48
Childhood Trauma Questionnaire	83.3 ± 15.62	52–101
PTSD Checklist for DSM-5 Total Symptom Severity	48.71 ± 14.5	16–68
Multidimensional Inventory of Dissociation (MID) Severe Pathological Dissociation	127.67 ± 37.96	19–164

Note: N = 21; ASI = anxiety sensitivity index; Range indicates the range of scores for this study sample.

symptoms. Participants are asked to rate their "worst feelings of depression in the past month" on a 4-point Likert scale ranging from 0 to 3, with higher scores indicating greater levels of depression. The BDI-II has demonstrated good reliability and validity across a variety of populations (Wang and Gorenstein 2013). The BDI-II total score was used as our dimensional measure of depressive symptom severity.

Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994). The CTQ is a 28-item self-report questionnaire that assesses history of childhood maltreatment. Participants are asked to rate the frequency of certain events in childhood on a 5-point Likert scale ranging from "Never true" to "Very often true", with higher scores indicating greater childhood trauma severity. The CTQ has demonstrated strong reliability and validity (Bernstein et al., 1994, 1997).

Multidimensional Inventory of Dissociation (MID; Dell 2006a). The MID is a multiscale measure that comprehensively assesses pathological dissociation. It has 218 items (168 dissociation items, 50 validity items) and is scored on an 11-point Likert scale ranging from "never" (0) to "always" (10). The MID assesses 14 major domains of dissociation, 23 dissociative symptoms, and includes 5 validity scales. The MID has been found to have strong psychometric properties (Dell 2006b; Somer and Dell 2005). Studies have supported its ability to discriminate among individuals with DID, dissociative disorder not otherwise specified (DDNOS), individuals with mixed psychiatric disorders, and nonclinical samples (Somer and Dell 2005; Dell 2001). We used the severe pathological dissociation subscale on the MID as our dimensional measure of dissociation. This scale specifies how many of the 168 dissociation items on the MID exceeded clinical significance cut-off scores.

PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2018). The PCL-5 is a 20-item self-report measure of PTSD symptoms. Participants are asked to indicate how much they have been bothered by each PTSD symptom over the past month on a 5-point Likert scale ranging from "Not at all" (0) to "Extremely" (4). The PCL-5 has been widely used in a variety of samples and has demonstrated strong reliability and validity (Blevins et al., 2015; Bovin et al., 2016). The PCL-5 total symptom severity score was used as our dimensional measure of PTSD symptom severity.

2.3. Procedure

Participants were recruited as part of a larger study examining the neurobiological mechanisms of trauma-related dissociation. As part of the study, participants completed a battery of self-report measures in a random order including measures on anxiety sensitivity (ASI), childhood trauma (CTQ), depression (BDI-II), PTSD symptoms (PCL-5), and pathological dissociation (MID). Following an explanation of the study's procedures, all participants provided written informed consent. Participants were compensated $200 for completing the study. All procedures were approved by the Mass General Brigham Institutional Review Board, and adhered to the United States Federal Policy for the Protection of Human Subjects.

2.4. Data analysis

All statistical analyses were conducted using SPSS version 24. A Pearson correlation analysis was used to examine the correlation between the main study variables. A multiple regression analysis tested which ASI subscales predicted depression in individuals with DID. To further define the relationship between anxiety sensitivity and severe pathological dissociation, we conducted a mediation analysis to test whether depressive symptoms mediated the relationship between anxiety sensitivity and severe pathological dissociation. The mediation analysis was performed using PROCESS macro version 3.5 in SPSS (Hayes 2017). Confidence intervals and p-values were calculated using bootstrapping based on 5,000 bootstrap samples. Reported p-values are two-tailed.

3. Results

3.1. High anxiety sensitivity in DID

Participants reported a range of anxiety sensitivity levels, but on average the total ASI scores in our sample were in the "high anxiety sensitivity" range (Table 2). Moreover, 17 of the 21 participants exceeded the "high anxiety sensitivity" cut-off score and no participants met criteria for "low anxiety sensitivity."

3.2. Anxiety sensitivity associated with depression in DID

Pearson correlations revealed symptoms of depression were positively associated with the anxiety sensitivity total score and all anxiety sensitivity subscales (Table 3). In contrast, no associations were found between anxiety sensitivity and severe pathological dissociation or PTSD symptoms.

A multiple regression analysis was performed to determine which types of anxiety sensitivity were the strongest predictors of depressive symptoms in individuals with DID. While anxiety sensitivity physical and social concerns did not predict depression, the anxiety sensitivity cognitive concerns subscale positively predicted depressive symptoms (Table 4).

3.2.1. Mediating role of depression

Given the relationship between anxiety sensitivity cognitive

Table 3
Symptom correlations.

Variable	1	2	3	4	5	6
1.ASI Total Score						
2.ASI Cognitive Concerns	0.89**					
3.ASI Physical Concerns	0.93**	0.69**				
4.ASI Social Concerns	0.74**	0.78**	0.48*			
5.BDI-II Total Score	0.62**	0.68**	0.51*	0.47*		
6.PCL-5 Total Score	0.39	0.39	0.35	0.25	0.57**	
7.MID Severe Pathological Dissociation Score	0.24	0.22	0.26	0.02	0.50*	0.58**

Note: * indicates $p < .05$. ** indicates $p < .01$ ASI is the Anxiety Sensitivity Index; BDI-II is the Beck Depression Inventory II; PCL-5 is the PTSD Checklist for DSM-5; Severe pathological dissociation is represented by the Multidimensional Inventory of Dissociation severe pathological dissociation subscale.

Table 4
Multiple linear regression predicting depressive symptoms in individuals with DID.

Model	R^2	F	*df*	β	t	p
Overall Model	0.39	5.19	3,17			0.010*
ASI Cognitive Concerns				0.76	2.25	0.038*
ASI Physical Concerns				0.05	0.22	0.825
ASI Social Concerns				−0.14	−0.51	0.616

Note: N = 21. Items with an asterisk (*) are statistically significant ($p < .05$); ASI is the Anxiety Sensitivity Index.

concerns and depressive symptoms, we were interested in a possible indirect relationship between anxiety sensitivity and dissociative symptoms through depression. There does not need to be a direct relationship between two variables when examining indirect effects (Bollen 1989; Cerin and MacKinnon 2009; Hayes 2009). Therefore, to test the possibility of an indirect relationship, we completed an exploratory mediation analysis and found evidence of an indirect relationship between anxiety sensitivity cognitive concerns and severe pathological dissociation (Fig. 1). Specifically, more severe ASI cognitive concerns were associated with more depressive symptoms, and more depressive symptoms predicted more severe pathological dissociation symptoms.

4. Discussion

Anxiety sensitivity is positively associated with symptom severity across many psychiatric disorders, including major depression and PTSD (Taylor et al., 1996; Taylor 2003). However, the role of anxiety sensitivity has not been studied in individuals with DID who commonly experience both depression and PTSD (Dorahy et al., 2014). We examined the relationship between anxiety sensitivity, PTSD, depression, and pathological dissociation in a sample of treatment-seeking females with DID. We hypothesized that individuals with DID would report high levels of anxiety sensitivity and that anxiety sensitivity would be positively associated with the severity of all three symptoms. Our hypotheses were partially supported. We observed high levels of anxiety sensitivity in our sample and established a direct relationship between anxiety sensitivity in the cognitive domain and depressive symptoms in DID. We also found that anxiety sensitivity had an indirect effect on pathological dissociation through depression.

4.1. High levels of anxiety sensitivity in DID

We found high levels of anxiety sensitivity in our DID sample. Clinical samples of individuals with PTSD and major depression report average total anxiety sensitivity scores of 31 and 25.3 respectively (Taylor 2003; Otto et al., 1995). Over 80% of our DID sample exceeded the anxiety sensitivity scores typically reported in PTSD and depression. Related work has also shown people with DID have high levels of fear about retrieving and accepting some memories based on the belief that doing so may have devastating and harmful consequences (Huntjens et al., 2022). These beliefs about anxiety signs and symptoms and memory may both contribute the maintenance of dissociative symptoms in DID.

5. Anxiety sensitivity, depression, and dissociation

We found that physical, cognitive, and social forms of anxiety sensitivity were all associated with symptoms of depression in DID, but when we included the three subdimensions of anxiety sensitivity in a regression model to predict depression, anxiety sensitivity cognitive concerns was the only significant predictor. Previous studies have shown that anxiety sensitivity cognitive concerns predicted increased severity of depression in individuals with high levels of depressive symptoms (Cox et al., 2001; Rector et al., 2007; Saulnier et al., 2018; Taylor et al., 1996). It is thought that this fear of cognitive dyscontrol exacerbates the distress elicited by depressive symptoms (Capron et al., 2013; Saulnier et al., 2018). Given our results, it is likely that the same feedback loop exists for depressive symptoms in DID as well.

Moreover, we found that anxiety sensitivity cognitive concerns had an indirect effect on pathological dissociation through depression. Specifically, higher levels of anxiety sensitivity cognitive concerns predicted more severe depressive symptoms, and more severe depressive symptoms predicted more severe pathological dissociation symptoms. It could be that anxiety sensitivity exacerbates depressive symptoms, which in turn, may exacerbate dissociative symptoms in DID – though this would need to be tested in longitudinal studies. Prior work in acute stress disorder and borderline personality disorder has directly linked anxiety sensitivity and dissociation (Demirkol' et al., 2020; Nixon and Bryant 2006). Together, this work and our findings suggest targeting anxiety sensitivity and depression may help alleviate some pathological dissociative symptoms.

5.1. Anxiety sensitivity and PTSD symptoms

In contrast to prior work (Fedroff et al., 2000; Taylor 2003), we did not find an association between anxiety sensitivity physical concerns and PTSD symptoms in our sample. The discrepancy may be explained by the presence of dissociative symptoms in our sample. Specifically, all participants met criteria for the dissociative subtype of PTSD as well as DID. As a result, our sample had high levels of several types of dissociation, including depersonalization, derealization, amnesia and identity alteration. Prior work in PTSD and anxiety sensitivity did not specify the severity of dissociative symptoms in their participants. Given prevalence rates of the dissociative subtype of PTSD (12–44% of PTSD cases; Armour et al., 2014; Hansen et al. 2016a,b; Swart et al., 2020; Wolf et al., 2012), we speculate that these prior samples had low levels of dissociation. High levels of dissociative coping responses in PTSD may provide enough distance from bodily sensations that they disrupt the

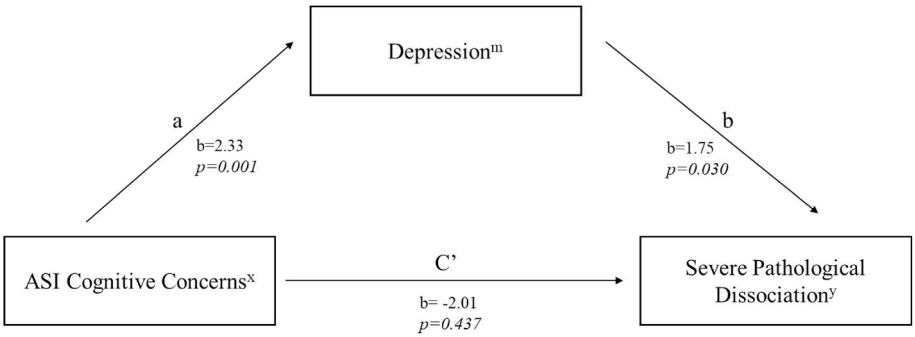

Fig. 1. Mediation model. Note: [x]Anxiety Sensitivity Index Cognitive Concerns Subscale; [m]Beck Depression Inventory II; [y]Multidimensional Inventory of Dissociation severe pathological dissociation subscale.

relationship between fear of arousal sensations and PTSD symptoms. Alternatively, we may be limited by our sample size. The relationship between anxiety sensitivity and PTSD symptoms in DID warrants further investigation.

5.2. Limitations

We acknowledge that this study has several limitations that constrain our conclusions. First, we have demonstrated a link between anxiety sensitivity and depression in DID; however, we have not tested whether anxiety sensitivity has a causal relationship to depression directly. It is possible depression also acts to increase anxiety sensitivity. Future longitudinal work is needed to test the causal relationship between anxiety sensitivity and depression in DID. Second, given our sample size, we did not explore the relationship between anxiety sensitivity and different types of dissociation (e.g., depersonalization, derealization, amnesia etc.) in our sample. There may be relationships between anxiety sensitivity and dissociation subtypes that remain unexplored. Third, we tested the relationship between anxiety sensitivity and other symptoms in a sample with co-occurring PTSD dissociative subtype and DID; however, individuals with only the dissociative subtype of PTSD (and no DID) may have a different relationship between anxiety sensitivity, depression, PTSD, and dissociative symptoms. Additionally, while individuals were diagnosed using gold-standard clinical interviews, dimensional symptom severity metrics were collected through self-report surveys, which may be subject to self-report bias. Finally, our sample comprised a majority of White women, and given the cultural impact on manifestations of anxiety, our results may not generalize to other samples.

5.3. Conclusions and clinical implications

We report the first empirical investigation of anxiety sensitivity and its relationship with common symptoms in DID. On average, we have identified high levels of anxiety sensitivity in DID. Furthermore, we found that anxiety sensitivity in the cognitive domain was a significant predictor of depressive symptoms, and a source of indirect influence on pathological dissociation through depression. Our results suggest that assessment for anxiety sensitivity in clinical practice for DID is warranted. If high levels of anxiety sensitivity are identified, the individual may benefit from targeted interventions which in turn may alleviate some symptoms of depression and dissociation in DID.

Author statement

Contributors: All authors have approved the final article. **XP:** Conceptualization, Formal analysis, Writing – Original Draft; **LAML**: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Writing – Review & Editing, Supervision, Project administration, Funding acquisition; **NGH:** Formal analysis, Writing – Review & Editing; **SRW**: Writing – Review & Editing; **MLK**: Writing – Review & Editing, Supervision; **CAP:** Writing – Review & Editing, Investigation; **CSK**: Writing – Review & Editing.

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Declaration of competing interest

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