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Investigating key mechanisms mediating the relationship between social anxiety and paranoia: A 3-month follow-up cross-cultural survey conducted in Thailand and the United Kingdom

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ABSTRACT

Because there is no evidence-based intervention for social anxiety in psychosis, and mechanisms of social anxiety-paranoia continuum remain to be elucidated. We aimed to investigate mediators between social anxiety and persecutory paranoia in a prospective cross-cultural analogue sample using interventionist-causal models to guide developments of new treatments for psychosis. This is a prospective online survey included participants aged ≥18-year-old in Thailand and the UK. Participants completed questionnaires at baseline (T1) and 3-month follow-up (T2) measuring social anxiety, paranoia, depression and mediators (stigma; internal and external shame; social rank; self-esteem; and safety behaviours). We used mediation analysis with 10,000 bootstrapping bias-corrected 95% confidence intervals (CI) to test indirect effects. At baseline, 842 participants completed the survey, and 336 Thai and 369 UK participants agreed to follow-up. Of these, 186 (70.4%female; mean age 34.9 ± 9.1) Thai and 236 (81.4%female; 35.7 ± 12.7) UK participants completed the survey at follow-up. A multiple mediation model (controlling for T1 depression and T1 paranoia and T2 social anxiety) showed significant indirect effects for change score (T2-T1) in external shame. These cross-cultural data suggest that external shame may mediate the prospective relationship between social anxiety and paranoia. Further research should focus on mechanistic approach to test the finding in psychosis.

1. Introduction

People diagnosed with schizophrenia can suffer with a variety of experiences, such as paranoia, grandiosity, hallucinations and anhedonia (Patel et al., 2014). They also suffer from problems with social relationships and activities because of deficits in social functioning (Aunjitsakul, 2018; Sutliff et al., 2015), leading to a comorbid social anxiety disorder (SAD) with a pooled prevalence rate of 21% (McEnery et al., 2019). This results in low functioning, low self-esteem, poor quality of life, severe depression, and a higher rate of suicide attempts amongst those with psychosis (Karatzias et al., 2007; Pallanti et al., 2004; Vrbova et al., 2017).

Despite the fact that Cognitive Behaviour Therapy (CBT) is the treatment of choice for individuals with a standalone diagnosis of SAD (National Collaborating Centre for Mental Health (UK), 2013) and for people with psychosis (CBTp) (National Institute for Health and Care Excellence, 2014), there is no evidence-based intervention for social anxiety in people with psychosis. Furthermore, mechanistically targeted recommendations for individual psychotic symptoms are needed (Brown et al., 2019), along with well-defined psychological treatment studies (Wykes et al., 2008). Additionally, social threats span a continuum from social anxiety to persecutory paranoia (Freeman et al., 2005). Social anxiety reflects an intense fear of negative evaluation by others while paranoia refers to an exaggerated belief about others intention to inflict harm (Clark and Wells, 1995; Freeman et al., 2005). However, understanding of the mechanisms underlying the relationship between social anxiety and paranoid ideation (a weaker form of psychotic experiences) are still limited (Michail et al., 2017). From the small number of studies completed to date, there is evidence that social anxiety and paranoia share predictors such as elevated depression, worry and interpersonal sensitivity. However, it seems that the presence of anomalous experiences differentiates paranoia from social anxiety (Freeman et al., 2008).

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Our goal is to test mechanistic processes that can be used to improve precision targeting of psychological interventions (i.e., CBT) for people with psychosis by identifying mechanisms underpinning both social anxiety and paranoia (Aunjitsakul et al., 2021).

Because persecutory ideation is found in the general population (Bebbington, 2013; Freeman et al., 2005) as well as clinical samples (Freeman et al., 2010), we conducted an analogue study measuring social anxiety and persecutory paranoia along with psychological factors that potentially influence social anxiety and paranoia thoughts. A recent systematic review (Aunjitsakul et al., 2021) identified the potential factors underlying social anxiety in psychosis. These were: social evaluative concerns including stigma, shame and social rank appraisals (Michail, 2013); self-esteem (Roe, 2001; Smith et al., 2006); and safety behaviours (Clark and Wells, 1995; Freeman et al., 2007). The identified safety behaviours particularly related to actions taken to manage perceived social threat. It was suggested that these factors are perhaps associated with reducing social anxiety as well as beliefs about malevolent influence (Aunjitsakul et al., 2021). With our aim of understanding how social anxiety develops into paranoia, we used the findings of the systematic review to select the psychological factors that could influence (or mediate) the social anxiety-paranoia relationship.

Most studies have investigated paranoid thinking in Western English-speaking samples in high income countries (Freeman et al., 2005; Johns LC et al., 2004; Kaymaz and van Os, 2010; Linscott and van Os, 2010). Given that paranoia and potential co-variates such as stigma and shame are directly linked to social norms and values, there is a need to expand the range of contexts in which these mechanisms are examined (Ha, 1995; Moleiro, 2018; Skodlar et al., 2008). So, we recruited samples from two cultural settings, Thailand and the UK to examine the influence of cross-cultural factors in the SAD-paranoia continuum.

We adhered to the interventionist-causal model approach (Kendler and Campbell, 2009) to identify a candidate factor(s) that should be measurable; amenable to change by the causal factor; and theoretically relevant to guide therapy. We hope that our finding(s) – the potential mechanism(s)– could be applied in cognitive behavioural approaches to precisely target treatment for not only SAD but also paranoia in people with psychosis. The target psychological interventions could be, for example, compassion focused techniques to alleviate stigma or shame experiences, cognitive restructuring approaches for low social rank appraisals and low self-esteem, or behavioural approaches to modify safety behaviours in people with psychosis. To identify potential mechanisms, this study investigated mediators (stigma, internal and external shame, social rank, self-esteem or safety behaviours) between social anxiety and persecutory paranoia in a prospective design with cross-cultural analogue samples.

We hypothesized that the relationship between social anxiety and paranoia would be mediated by changes in stigma, internal and external shame, social rank, self-esteem, and safety behaviours.

2. Methods

This is a prospective study surveying the Personal Attitudes towards Social life related to Oneself (the PASO survey) amongst the general population in Thailand and the UK via internet-based questionnaire. Data were collected at baseline and 3-month follow-up. The survey was reviewed and approved by the Ethics Committee of the Faculty of Medicine, Prince of Songkla University, Thailand (Code: REC.62-179-3-1) and College of Medical, Veterinary & Life Sciences, University of Glasgow, UK (Code: 200180144) in accordance with the Declaration of Helsinki.

2.1. Participants

Eligible participants were aged ≥18 years old and living in Thailand or the UK who were fluent in Thai or English. Those who were able to access the internet either from desktop computers or from mobile electronic devices (smartphones and tablets), were invited to take part in the survey.

2.2. Measurements

We used nine instruments to measure social anxiety, paranoia, stigma, internal and external shame, self-esteem, social rank, and safety behaviours, as well as negative affect. Of these instruments, the Rosenberg Self Esteem Scale and the Depression Anxiety Stress Scale, have both English and Thai versions. Other instruments with only English versions were translated into Thai, then back-translated to English by two independent translators (Warut Aunjitsakul and another bilingual academic in a different field), using guidelines for cross-cultural adaptation of self-report measures (Beaton et al., 2000). Any discrepancies were resolved by discussion with Andrew Gumley and Hamish McLeod. Pilot versions of the PASO survey were tested in both cultural settings to test their understanding, readability and flow. In a pre-cursor cross-sectional study, the PASO survey has shown adequate to excellent reliability of rated measurements amongst Thailand and the UK with mean of overall values of Cronbach's alpha was 0.90 (0.74–0.98) and 0.93 (0.86–0.98), respectively.

2.2.1. Instruments

2.2.1.1. Social anxiety. The Social Interaction Anxiety Scale (SIAS) has 20-item rated on a 5-point scale from 0 (not at all) to 4 (extremely) (Mattick, 1998). Scores range between 0 and 80, with higher scores indicating greater social anxiety. The scale has been shown to have good reliability (test-retest correlations 0.92), internal consistency (Cronbach's alpha 0.94) and validity (Mattick, 1998). Cronbach's alpha in this study was at 0.94 (Thai) and 0.95 (UK). We used the cut-off >36 scores in determining social phobia (Peters, 2000).

2.2.1.2. Paranoia. The Green et al. Paranoid Thought Scales (GPTS) is a 32-item questionnaire used for measuring ideas of social reference (16-item) and persecutory fears (16-item) (Green, 2008). Responses are on a 5-point scale from 1 (not at all) to 5 (totally). A total score of the social reference and persecutory ideations is from 16 to 80, with higher scores indicating higher severity. The GPTS has shown good reliability (intra--class correlation of social reference 0.88 and persecutory fears 0.81) and validity during testing and development (Green, 2008). Cronbach's alpha was 0.92 (Thai) and 0.96 (UK) of social reference and 0.95 (Thai) and 0.97 (UK) of persecutory fears.

2.2.1.3. Stigma. The Reported and Intended Behaviour Scale (RIBS) (Evans-Lacko et al., 2011) was used to measure stigma developed to reflect discriminative experiences. The 8-item RIBS examines stigma related intended behaviour against people with mental illness in different degree of social contexts (i.e., family, colleagues, neighbour) which these items relate to social threat cognitions (of this study). The first 4-item only calculate the occurrence of the behaviour towards mental health problems in 4 contexts, they are not given a score value. Items 5–8 are scored on an ordinal scale from 1 (strongly disagree) to 5 (strongly agree). 'Don't know' is coded as neutral (i.e., 3). The total score is calculated by adding together the response values for items 5–8. Overall test-retest reliability (0.75), Cronbach's alpha (0.85) and validity of the RIBS is good (Evans-Lacko et al., 2011). Our calculated Cronbach's alpha was 0.88 (Thai) and 0.89 (UK).

2.2.1.4. Shame. Both internal shame and external shame were measured. The Internalised Shame Scale (ISS) measures negative self-evaluation, personality characteristics or behaviours (David and Cook, 1988). The ISS contains 24-item rated on a 5-point scale ranging from 0 (never) to 4 (almost always) and has demonstrated satisfactory reliability with test-retest correlations 0.81–0.93, and Cronbach's alpha 0.95

(David and Cook, 1988; Vikan et al., 2010) and of this study 0.98 (Thai) and 0.97 (UK).

The Other As Shamer Scale (OASS) is used to measure the external shame arising from negative evaluations about how others judge the self (Goss et al., 1994). The OASS consists of 18-item rated on a 5-point scale from 0 (never) to 4 (almost always). The scale showed high internal consistency (Cronbach's alpha 0.92) (Allan et al., 1994; Goss et al., 1994) and 0.96 (Thai) and 0.96 (UK) in this study. Higher score of ISS and OASS indicates higher shame.

2.2.1.5. Self-esteem. The Rosenberg Self-Esteem Scale (RSES) includes 10-item rated on a 4-point scale with from 0 (strongly disagree) to 3 (strongly agree) (Rosenberg, 1965). A higher score indicates higher self-esteem. Both the English (test-retest correlations 0.82–0.88), internal consistency (Cronbach's alpha 0.77–0.88 (Rosenberg, 1965) and 0.91 (this study)) and Thai language versions (Cronbach's alpha 0.85 (Wongpakaran and Wongpakaran, 2012) and 0.89 (this study)) of the RSES have shown high reliability and validity.

2.2.1.6. Social rank. The Social Comparison Scale (SCS) measures self-perceptions of social rank and relative social standing (Allan and Gilbert, 1995). Participants were asked to describe themselves in comparison to others through 11 bipolar items with a ten-point scale (i.e., 1 = inferior to 10 = superior). Higher scores indicate higher perceived social rank and the scale has good reliability (test-retest correlations 0.84) and internal consistency (Cronbach's alpha 0.87 (Allan and Gilbert, 1995) and 0.97 (Thai) and 0.92 (UK) in this study).

2.2.1.7. Safety behaviours. The Subtle Avoidance Frequency Examination (SAFE) is a measure of safety behaviour emitted to cope with social threats (Cuming et al., 2009). The 32-item is rated on a 5-point scale ranging from 1 (never) to 5 (always). There are three subscales relating to safety-seeking strategies: active safety behaviours, (e.g. say that you are sick); subtle restriction of behaviour, (e.g. hold your cup/glass tightly); and behaviours aimed at avoiding/concealing physical symptoms when engaging in a social situation (e.g. avoid eye contact). Higher scores indicate a higher use of safety-seeking behaviours. SAFE has shown good discriminant and construct validity, high internal consistency with Cronbach's alpha 0.83–0.87 (Cuming et al., 2009) and 0.96 (Thai) and 0.96 (UK) in this study.

2.2.1.8. Negative affect. The Depression Anxiety Stress Scales (DASS-21) is a measure of general negative affect and distress containing 21-item rated on a 4-point scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much) (Lovibond, 1995). There are three dimensions: depression (7-item), anxiety (7-item) and stress (7-item). This instrument has shown good reliability for depression, anxiety and stress in both English (Cronbach's alpha 0.84–0.91) and Thai versions (Cronbach's alpha 0.70–0.86) (Lovibond, 1995; Oei et al., 2013) and this study (0.85–0.91 (Thai) and 0.90–0.95 (UK)). We measured negative affect because of its links to the anticipation of danger, interpersonal sensitivity and engagement in worry, resulting in negative/implausible ideas. Also, because depression commonly co-occurs in social anxiety and psychosis (Varghese et al., 2011) we used depression as a covariate in data analyses.

2.3. Data collection

The PASO survey was advertised via personal contacts, online advertisements (e.g., University websites) or social media (Twitter, Facebook, Gumtree, Reddit, Freeads) and via posters in community, University or third sector organisations. Participants accessed the survey through a URL link or by scanning QR code from advertisements. The participant information sheet was presented, they agreed to take part in the study by clicking a consenting checkbox. At baseline (T1) participants were asked to complete the nine instruments, gender, age, ethnicity, academic qualifications, jobs related to healthcare, and history with a mental health. At the end of the questionnaire, if participants agreed to follow-up they provided an email address and the nine instruments were readministered 3 months later (T2). It was emphasised to participants that their data remained confidential and anonymous. Incentives were offered to participants via a prize draw for 2,000 Thai Baht (Thailand) or a £200 voucher (UK) for the winner.

2.4. Data analysis

IBM SPSS Statistics for Windows, Version 27.0 was used for data analyses. Data from Thailand and the UK were combined from those who provided complete data at both T1 and T2. Descriptive statistics were used to explore population characteristics and factors of interest such as social anxiety, paranoia, stigma, shame, social rank, self-esteem, safety behaviours and negative affect. Differences for continuous data between completers and those who dropped-out from each country sample, and between T1 and T2 in combined samples were analysed by independent and dependent Student's T-test, respectively. Pearson Chi-square and McNemar tests were used to compare differences between unpaired and paired categorical data. As we adhered to the interventionist-causal approach which the factors should be manipulable (or able to be changed by psychological interventions) (Kendler and Campbell, 2009), thus we tested instability of mediators linking social anxiety and persecutory paranoia prospectively, and calculated a change in variable score between baseline and 3-month follow-up. In other words, each change in variable score (Δ) was the observed value at T2 minus T1. Associations between variables were calculated using Pearson's correlation coefficients. Linear regression was conducted to investigate independent variables (i.e., paranoia T1, social anxiety T1, change in mediators including stigma, internal and external shame, social rank, self-esteem and safety behaviours) associated with predicting dependent variable (paranoia T2). Stepwise multiple regression analysis was conducted to confirm the predictor outcomes. Depression T1, social anxiety T2 and paranoia T1 were used to control regression analyses. The mediation analysis was to test whether the change in mediator(s) was associated with social anxiety T1 and paranoia T2. This association was tested in simple and parallel multiple mediation models with co-varying for depression T1, social anxiety T2 and paranoia T1 (see Supplementary Fig. 1, panel A and B). The PROCESS macro for SPSS version 3.4 (Hayes, 2018) was used for the mediation analyses. 10,000 bias-corrected bootstrap samples were performed to estimate 95% confidence intervals of the indirect effect.

2.4.1. Post-hoc analyses

Because those with mental illness, job-related to health care, social anxiety experiences factors may preserve some respondent bias that might affect mediator outcomes, so it required sensitivity analyses to confirm the outcomes. Thus, we additionally controlled theses three factors as a covariate in the simple and multiple mediation analyses.

3. Results

3.1. Population and variable characteristics

At baseline, 842 participants completed the survey, and 336 Thai and 369 UK participants agreed to follow-up in three months. Of these, there were 186 (55.4%) Thai and 236 (64.0%) UK samples responded at follow-up, totalling 422 participants with complete data for this study. Mean age of those at follow-up in Thailand was lower than those who dropped-out (34.9 vs 37.1, $p = 0.03$) whereas mean age at follow-up in the UK was higher than for those in the drop-out group (35.7 vs 32.4, $p = 0.01$). Those with a history of mental health problems were more likely to follow-up than drop-out in Thailand (34.4% vs 22.0%; $p < 0.05$) and the UK (81.4% vs 66.5%; $p = 0.001$). Other characteristics (e.g., gender, jobs

related to healthcare and social phobia) did not show significant differences (see Table 1). For mediator variables, there were no significant differences between drop-out and follow-up groups of both countries, except internal shame of Thai sample in the drop-out group was lower than the follow-up group (Supplementary Table 1).

Female respondents were most common at both baseline and follow-up with approximately 70% in Thailand and 80% in the UK. The UK sample had a higher proportion meeting the threshold for social phobia group compared to the Thai sample at baseline (53.5% vs 23.0%) and follow-up (52.1% vs 26.3%) (Table 1). Table 2 shows the combined data, from Thailand and the UK, of change in potential variables at two-time points. Mean social anxiety at follow-up was significantly lower than baseline (SIAS: 33.3 vs 34.4; $p < 0.01$). Mean score of social reference, internal shame, safety behaviours, depression, anxiety and stress significantly decreased from baseline to follow-up. Other variables showed no significant differences over time.

3.2. Intercorrelation of change in variables

Higher change in social anxiety and higher change in paranoia was correlated ($r = 0.23$, $p < 0.01$). The change score between internal shame and external shame was the strongest correlation ($r = 0.54$, $p < 0.01$). There were no significant associations of change in social rank scores with other variables, see Supplementary Table 2. Regardless of the change scores, the intercorrelations of variables at baseline and follow-up are presented in Supplementary Table 3.

3.3. Linear regression analysis associated with predicting paranoia at follow-up

Paranoia score at baseline significantly predicted paranoia score at follow-up (GPTS Persecutory T1: B 0.70, $p < 0.001$) (Model 1, Table 3) and social anxiety score at baseline significantly predicted paranoia score at follow-up (SIAS T1: B 0.30, $p < 0.001$) (Model 2) in combined Thai and UK samples. After adjusting for depression at baseline in model 4, both paranoia and social anxiety at baseline predicted paranoia at follow-up (GPTS Persecutory T1: B 0.61, $p < 0.001$; and SIAS T1: B 0.07, $p < 0.05$). When all change scores of potential mediators (RIBS, ISS, OASS, SCS, RSES and SAFE) were added to the model controlling for depression, significant predictors of paranoia at follow-up were paranoia and social anxiety at baseline, and change in stigma, external shame and safety behaviours (see Model 5). We also performed an alternative stepwise regression analysis. Consistently, the final model included six significant predictors: paranoia; social anxiety; and depression score at baseline, and change scores of stigma; external shame; and safety behaviours.

Table 2
Potential variables in combined Thai and UK samples at baseline and 3-month follow-up (N total = 422).

Variables	Baseline (N = 422)	3-month follow-up (N = 422)	p-value[a]
SIAS	34.4 ± 17.6	33.3 ± 17.6	*<0.01*
SIAS (>36 or social phobia); n (%)	172 (40.8)	161 (38.2)	0.14[b]
GPTS Reference	32.3 ± 12.6	30.7 ± 12.5	*<0.001*
GPTS Persecutory	24.1 ± 12.0	23.4 ± 11.8	0.10
RIBS (items 5–8)	8.3 ± 4.2	8.1 ± 4.1	0.12
ISS	40.5 ± 27.8	38.25 ± 27.6	*<0.001*
OASS	24.9 ± 16.4	24.3 ± 16.7	0.14
SCS	51.0 ± 22.6	52.7 ± 21.7	0.14
RSES	26.9 ± 7.4	26.9 ± 7.2	0.97
SAFE	38.5 ± 24.3	36.5 ± 25.3	*<0.01*
DASS Depression	15.8 ± 13.0	14.9 ± 12.7	*0.02*
DASS Anxiety	11.9 ± 10.6	10.7 ± 10.1	*<0.001*
DASS Stress	16.8 ± 11.2	16.1 ± 11.1	*<0.05*

DASS, Depression Anxiety Stress Scales; GPTS, Green Paranoid Thought Scales; ISS, Internalised Shame Scale; OASS, Other As Shamer Scale; RIBS, Reported and Intended Behaviour Scale; RSES, Rosenberg Self-Esteem Scale; SAFE, Subtle Avoidance Frequency Examination; SCS, Social Comparison Scale; SIAS, Social Interaction Anxiety Scale.
Data are mean ± SD unless otherwise indicate.
[a] Dependent T-test (2-tailed).
[b] McNemar test.

3.4. Mediation analysis investigating the direct, indirect and total effects of social anxiety (at baseline) towards paranoia (at follow-up) with co-varying as depression and paranoia (at baseline) and social anxiety (at follow-up)

Regarding a simple mediation analysis, social anxiety at baseline was related to paranoia at follow-up through its relationship with the changes in internal shame, external shame and safety behaviours when controlling for depression and paranoia at baseline and social anxiety at follow-up. The direct effect of social anxiety at baseline on change in internal shame was $a = -0.57$ ($p < 0.001$), the direct effect of change in internal

Table 1
Baseline population characteristics of general populations in Thailand and the UK compared between those who completed 3-month followed-up (n = 422) and dropped out (n = 420).

Characteristics	Thailand; n (%)				UK; n (%)			
	Total (n = 427)	Follow-up (n = 186)	Drop-out (n = 241)	p-value[a]	Total (n = 415)	Follow-up (n = 236)	Drop-out (n = 179)	p-value[a]
Gender				0.54				0.43
Male	133 (31.1)	55 (29.6)	78 (32.4)		83 (20.0)	44 (18.6)	39 (21.8)	
Female	294 (68.9)	131 (70.4)	163 (67.6)		332 (80.0)	192 (81.4)	140 (78.2)	
Age (Years); mean ± SD (min-max)	36.2 ± 10.4 (18–69)	34.9 ± 9.1 (18–69)	37.1 ± 11.2 (18–66)	*0.03*[b]	34.3 ± 12.4 (18–73)	35.7 ± 12.7 (18–72)	32.4 ± 11.9 (18–73)	*0.01*[b]
Jobs related to healthcare				0.11				0.19
Yes	170 (39.8)	82 (44.1)	88 (36.5)		123 (29.6)	76 (32.2)	47 (26.3)	
No	257 (60.2)	104 (55.9)	153 (63.5)		292 (70.4)	160 (67.8)	132 (73.7)	
History with a mental health problem				*<0.05*				*0.001*
Yes	117 (27.4)	64 (34.4)	53 (22.0)		311 (74.9)	192 (81.4)	119 (66.5)	
No	310 (72.6)	122 (65.6)	188 (78.0)		104 (25.1)	44 (18.6)	60 (33.5)	
SIAS				0.14				0.52
≤36	329 (77.0)	137 (73.7)	192 (79.7)		193 (46.5)	113 (47.9)	80 (44.7)	
>36 (social phobia group)	98 (23.0)	49 (26.3)	49 (20.3)		222 (53.5)	123 (52.1)	99 (55.3)	

SIAS, Social Interaction Anxiety Scale.
Data are n (%) unless otherwise indicate.
[a] Pearson Chi-square test.
[b] Independent T-test.

Table 3
Linear regression analysis associated with dependent variable (GPTS Persecutory T2) predicted by independent variables (N total = 422).

Model	Change independent variable score†	Adjusted R^2	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std error	Beta		
1	(Constant)	0.51	6.46	0.90		7.16	0.000
	GPTS Persecutory T1		0.70	0.03	0.72	20.96	*0.000*
2	(Constant)	0.20	12.98	1.13		11.54	*0.000*
	SIAS T1		0.30	0.03	0.45	10.40	*0.000*
3	(Constant)	0.53	4.69	1.00		4.71	0.000
	GPTS Persecutory T1		0.63	0.04	0.65	16.96	*0.000*
	SIAS T1		0.10	0.03	0.15	3.93	*0.000*
4	(Constant)	0.53	5.00	1.01		4.97	0.000
	GPTS Persecutory T1		0.61	0.04	0.63	15.92	*0.000*
	SIAS T1		0.07	0.03	0.10	2.22	*0.027*
	DASS Depression T1		0.08	0.04	0.09	1.90	0.058
5†	(Constant)	0.58	5.37	0.96		5.58	0.000
	GPTS Persecutory T1		0.61	0.04	0.62	16.55	*0.000*
	SIAS T1		0.07	0.03	0.11	2.54	*0.011*
	DASS Depression T1		0.08	0.04	0.09	2.00	*0.046*
	Δ RIBS (items 5–8)		0.30	0.14	0.07	2.13	0.034
	Δ ISS		0.05	0.04	0.06	1.39	0.167
	Δ OASS		0.18	0.05	0.13	3.45	*0.001*
	Δ SCS		−0.001	0.02	−0.003	−0.08	0.937
	Δ RSES		−0.01	0.12	−0.003	−0.08	0.940
	Δ SAFE		0.09	0.03	0.10	2.74	*0.006*

DASS, Depression Anxiety Stress Scales; GPTS, Green Paranoid Thought Scales; ISS, Internalised Shame Scale; OASS, Other As Shamer Scale; RIBS, Reported and Intended Behaviour Scale; RSES, Rosenberg Self-Esteem Scale; SAFE, Subtle Avoidance Frequency Examination; SCS, Social Comparison Scale; SIAS, Social Interaction Anxiety Scale.
† Regarding the stepwise regression analysis, the final model of GPTS Persecutory T2 included GPTS Persecutory T1 (B 0.62, $p < 0.001$), SIAS T1 (B 0.07, $p = 0.014$), DASS Depression T1 (B 0.07, $p = 0.061$), Δ RIBS (B 0.31, $p = 0.029$), Δ OASS (B 0.22, $p < 0.001$), and Δ SAFE (B 0.10, $p = 0.002$) with adjusted R square 58.3%.
Note: T1 and T2 refer to at baseline and 3-month follow-up; Δ refers to change in variable score which an observed value at T2 minus T1.

shame on paranoia at follow-up was b = 0.10 ($p < 0.01$), and the indirect effect was ab = −0.06 (95%CI = −0.0985, −0.0206) based on 10,000 bootstrapped samples. The other significant indirect effects through changes in external shame and safety behaviours mediators were ab = −0.06 (95%CI = −0.1063, −0.0281) and ab = −0.07 (95%CI = −0.1249, −0.0150) (Table 4).

A multiple mediation analysis controlling for depression and paranoia at baseline and social anxiety at follow-up was examined to test with all changes in potential variables, shown in Fig. 1. Only external shame showed a significant indirect effect through the relationship of social anxiety at baseline and paranoia at follow-up. The direct effect of social anxiety at baseline on change in external shame was a = −0.31 ($p < 0.001$), the direct effect of change in external shame on paranoia at follow-up was b = 0.17 ($p < 0.01$), and the indirect effect was ab = −0.05 (95%CI = −0.0949, −0.0152) based on 10,000 bootstrapped samples.

3.5. Post-hoc analyses

Considering sensitivity analyses, internal shame, external shame and safety behaviours retained significant indirect effects in simple mediation analyses, meanwhile only external shame retained a significant indirect effect in multiple mediation analysis amongst groups of having mental illness, job-related healthcare and social anxiety experiences, see Supplementary Table 4, 5 and 6.

Table 4
Results of simple and parallel multiple mediation analyses examining direct, indirect and total effects of the independent variable (SIAS T1), dependent variable (GPTS Persecutory T2) and changes in potential mediator score controlling for DASS Depression T1, SIAS T2 and GPTS Persecutory T1.

	Independent variables	Changes in mediator	Effect of social anxiety T1 on change in mediator (a)	Unique effect of change in mediator (b)	Indirect effect (ab)	Bootstrapping bias-corrected 95% CI	Direct effect (c')	Total effect (c)
Simple mediation analysis	GPTS Persecutory T2	RIBS (items 5–8)	−0.04*	0.24	−0.009	−0.0279, 0.0021	−0.20***	−0.21***
		ISS	−0.57***	0.10**	−0.056	−0.0985, −0.0206	−0.16**	−0.21***
		OASS	−0.31***	0.21***	−0.064	−0.1063, −0.0281	−0.15**	−0.21***
		SCS	0.20	−0.01	−0.001	−0.0089, 0.0068	−0.21***	−0.21***
		RSES	0.07**	−0.09	−0.006	−0.0300, 0.0134	−0.21***	−0.21***
		SAFE	−0.70***	0.09**	−0.066	−0.1249, −0.0150	−0.15**	−0.21***
Multiple mediation analysis	GPTS Persecutory T2						−0.10	−0.21***
		RIBS (items 5–8)	−0.04*	0.25	−0.009	−0.0272, 0.0017		
		ISS	−0.57***	0.03	−0.018	−0.0668, 0.0267		
		OASS	−0.31***	0.17**	−0.052	−0.0949, −0.0152		
		SCS	0.20	0.001	0.0003	−0.0068, 0.0089		
		RSES	0.07**	0.01	0.0004	−0.0225, 0.0229		
		SAFE	−0.69***	0.05	−0.036	−0.0923, 0.0189		

GPTS, Green Paranoid Thought Scales; ISS, Internalised Shame Scale; OASS, Other As Shamer Scale; RIBS, Reported and Intended Behaviour Scale; RSES, Rosenberg Self-Esteem Scale; SAFE, Subtle Avoidance Frequency Examination; SCS, Social Comparison Scale; SIAS, Social Interaction Anxiety Scale.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
Note: T1 and T2 refer to at baseline and 3-month follow-up; Δ refers to change in variable score which an observed value at T2 minus T1.

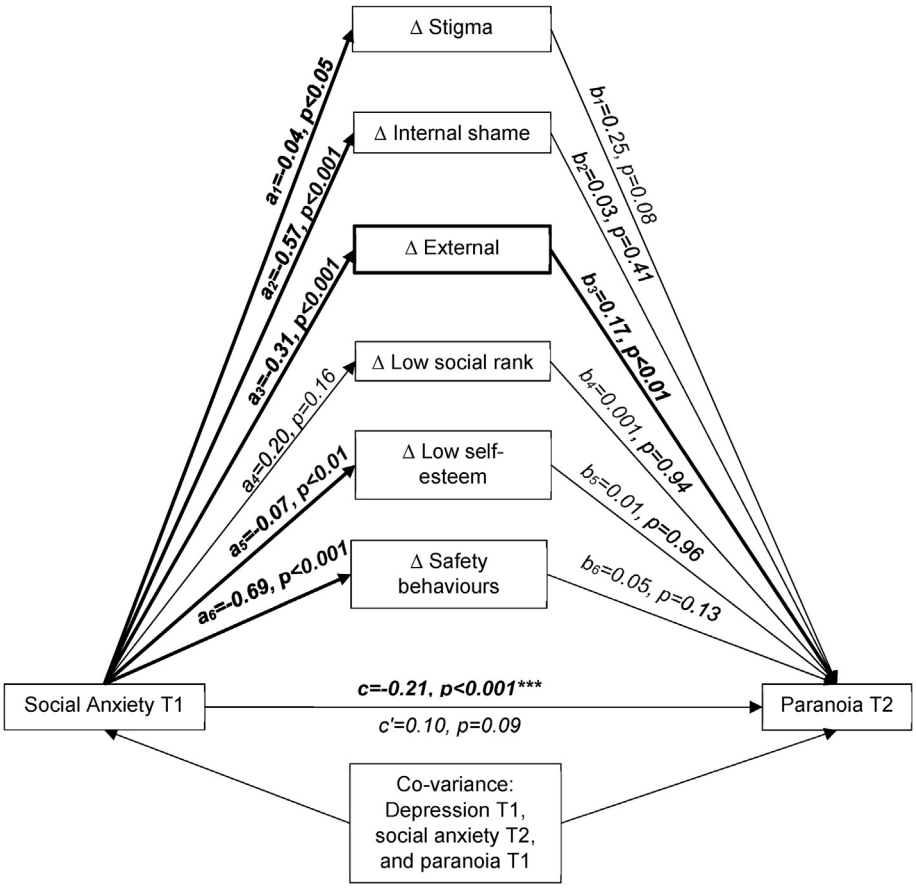

Fig. 1. The calculated results of the Multiple Mediation analyses of the relationship between change in mediator scores (T2-T1) and social anxiety T1 and paranoia T2. † Value of indirect effect of the external shame (a_3b_3) = −0.05, 95%CI -0.0949, −0.0152. Note: T1 and T2 refer to at baseline and 3-month follow-up; Δ refers to change in variable score which an observed value at T2 minus T1.

4. Discussion

This study set out to prospectively investigate the mediators between social anxiety and persecutory paranoia. We asked whether changes in stigma, internal and external shame, social rank, self-esteem or safety behaviours fully mediate the social anxiety and paranoia relationship. A prospective design with cross-cultural analogue samples was conducted in two national settings in Thailand and the UK. Regarding the simple mediation analyses, changes of internal shame, external shame and safety behaviours were partial mediators of the social anxiety-paranoia relationship. In the multiple mediation analysis, the change of external shame was found to be a full mediator. Furthermore, after performing sensitivity analyses, we found consistent evidence of mediator outcomes to the main analyses, resulting in internal shame and safety behaviours (from simple mediation models) and external shame (from both simple and multiple mediation models). Our findings consistently found that external shame was a potential mediator, meaning that people with social anxiety could exacerbate to paranoia through external shame appraisals. In our baseline data (of the PASO survey), we conducted a cross-cultural comparison, revealing that external shame was the only significant mediator of social anxiety-paranoia relationship in both Thailand and the UK, while safety behaviours and self-esteem was significant mediators in the UK sample. There might be some shared patterns of sensitivity to social shame across cultures regarding human evolution of shame capacities (Sznycer et al., 2016, 2018), this could influence cross-culturally shared coping strategies (or safety behaviours) to shame and embarrassment. The existing understanding showed that shame is strongly associated with social anxiety (Birchwood et al., 2006; Michail and Birchwood, 2013) and paranoia ideation (Johnson et al., 2014; Matos et al., 2013). Also, worry related thinking (i.e., the shame appraisals) can lead plausible ideas into implausible ideas (Freeman and Garety, 1999) including paranoia ideation (Sun et al., 2018). Some people with social anxiety may develop paranoia if shame appraisals transform from plausible ideas into much more threatening predictions. Hence, shame-based thoughts such as "I made a fool of myself" and "People will laugh at me" may exacerbate into more catastrophic and paranoid thoughts with repeated worry cycles that attempt to predict and prepare for worst case outcomes. In this way, more frightening social anxiety may worsen into more paranoid chains of thought such as "If you're vulnerable people will attack you", "People are ganging up against me" and ultimately "They want to kill me". It remains to be examined in future studies, but this is one possible pathway by which individuals with social anxiety may develop persecutory ideas through negative re-appraisals of shame experiences.

Considering shame subtypes, external shame is more strongly associated with paranoia than internal shame (Matos et al., 2013). This is perhaps because external shame is focused on perceived negative aspect of oneself from others' viewpoints (Gilbert, 2003). In turn, suspiciousness along with a catastrophising style of processing leads to paranoid delusion formation (Aunjitsakul et al., 2021; Freeman, 2007). A key suggestion from our data is that the pathway from social anxiety to paranoia is mediated by increasing shame related cognitions, particularly external shame experiences.

As for other potential factors, internal shame and safety behaviours were also a significant (partial) mediator in the simple mediation analyses. Meanwhile, stigma, social rank and self-esteem were not a significant mediator. These findings partially supported our a priori hypothesis. A possible explanation may be somewhat limited by lower

levels of symptom severity and functional impact in our sample, i.e., lower use of safety behaviours. These factors may be significant amongst people with significant or higher degree of distress (e.g., first-episode psychosis, schizophrenia). Future studies on these factors (e.g., stigma, internal shame, social rank, self-esteem and safety behaviours) with social anxiety-paranoia associations are therefore not recommended in general population but should be undertaken in clinical research.

Additionally, in the regression analyses, a significant association between paranoia at baseline and paranoia at follow-up as well as social anxiety at baseline and paranoia at follow-up was found amongst the combined two national samples. In a hierarchical regression model, when all changes in potential variable were added with adjusting for depression, paranoia and social anxiety at baseline, and changes in stigma, external shame and safety behaviours factors significantly predicted paranoia at follow-up. The social fears, stigma and shame cognitions along with safety behaviours could play a significant role in predicting paranoia in people with psychosis (Aunjitsakul et al., 2021; Michail and Birchwood, 2013).

To our knowledge, this is the first study prospectively surveying social fears and paranoid thinking across cultural settings, aiming to identify potential mediators influencing the relationship between social anxiety and paranoia. The strengths of this study were as follows. This was a cohort study, highlighting that our findings could explain the temporal relationship between social anxiety and paranoia and potential mechanisms. We investigated the potential mechanisms underlying social anxiety and paranoia with utilizing cross-cultural data. Moreover, good to excellent reliability of measures in these samples was established, and our collected sample size is large enough to confident mediator outcomes. There were a few limitations of the current study. Firstly, people without access to the digital means were unable to participate in the study, although the survey was carefully adverted in various methods including via online advertisements or social media and via posters. Secondly, the loss to follow-up in the sample is a limitation due to the study design, nonetheless, reminding email has been sent up to three times for those who not completing the survey. Thirdly, exclusion of those aged under 18-year-old (due to ethical perspective) may limit a number of younger population which this age group is high relevant to the onset of social anxiety and psychotic disorders. Lastly, the samples were convenience samples and not representative of broader populations. Future research should investigate the hypothesized potential factors in younger, larger and clinical samples.

Because psychotic experiences i.e., paranoia can be found in general population, not only clinical population (Freeman et al., 2005) and our survey found external shame mediates social anxiety-paranoia continuum, this may help to provide an opportunity to understand psychotic experiences and gain clinical useful information to guide psychological treatments. If the finding can be replicated, there is scope for developing innovative treatments that can test this mechanism in a clinical population and in interventionist-causal treatment trials (Kendler and Campbell, 2009). Considering the interventionist-causal approach (Kendler and Campbell, 2009), the external shame may be a potential factor since it is measurable (Goss et al., 1994), amenable to change in the putative causal process and relevant with a theoretical understanding to guide therapy (Birchwood et al., 2006; Johnson et al., 2014; Matos et al., 2013; Michail and Birchwood, 2013).

This study conducted in analogue samples that a bit far-fetched to conclude the potential mechanisms in clinical practice, thus the following suggestions should be careful consideration. We provide some implications of how to use the mechanisms to guide psychological interventions for people with psychosis. Regarding the standard cognitive behavioural approach which CBT is an effective treatment for both social anxiety and psychosis, it could be effective to develop tailored-made CBT in treating social anxiety in people with psychosis by focusing on shame cognitions (Michail et al., 2017), suggesting to consider helping clients with identifying negative social evaluations along with targeting external shame. Furthermore, the mindfulness interventions are feasible and effective for people with psychosis (Khoury et al., 2013). Practicing mindfulness i.e., Compassion Focused Therapy could improve compassion for the self and for others including paranoid symptoms (Brown et al., 2020). Because those with paranoia are more likely to attack themselves in a hateful way and less likely to reassure themselves in a supportive way (Brown et al., 2020). By doing mindfulness, individuals will be learned how to deal with shame cognitions by fostering and soothing their internal experiences in a supportive way, this could help alleviate paranoid ideation (Castilho et al., 2019) and improve emotional distress and social-related concerns (Braehler et al., 2013).

In conclusion, multiple mediation analyses revealed the relationship between social anxiety and paranoia was fully mediated by change in external shame. We suggest that external shame could be tested in further experimental manipulation studies in clinical populations to investigate whether this factor could be targeted as a causal mechanism in treatment of social anxiety and paranoia.

Conflict of interest

The authors declare no conflict of interest.

Ethical standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

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Authors contributions

WA: Conceptualization, Methodology, Formal analysis, Investigation, Data Curation, Writing - Original Draft, Writing - Review & Editing, Visualization, Project administration and Funding acquisition. AG and HM: Conceptualization, Methodology, Writing - Review & Editing, Visualization, Supervision. All authors contributed to and have approved the final manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.psycom.2022.100028.

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