

**The cross-lagged relationship between loneliness, social support, and psychotic-like experiences in young adults.**

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## **Abstract**

**Background:** Individuals with psychotic disorders often report feelings of loneliness, fewer social contacts and less satisfaction with their social support prior to diagnosis. However, the temporal relationships between these variables remain unclear. The primary aim of this study was to examine whether subjective and objective social factors predict, or are predicted by, psychotic-like experiences (PLEs) in healthy young adults.

**Methods:** A total of 196 undergraduates completed baseline and 3-month follow up assessments for PLEs, loneliness, social support size, and satisfaction. Cross-lagged panel models were conducted to investigate the temporal relationships between these variables.

**Results:** Higher loneliness scores, fewer social contacts, and being less satisfied with social support at both time points were significantly associated with higher endorsement of PLEs. Furthermore, after controlling for baseline levels, cross-lagged analyses revealed that individuals who reported feeling more lonely and having less social support at baseline, predicted higher PLEs three months later but not vice versa. No cross-lagged effect was found between satisfaction of social support and PLEs.

**Conclusion:** The study highlights the significant relationships between loneliness, social support and PLEs. Higher levels of loneliness and smaller social support networks predicted future PLEs. These findings need to be given full consideration in future clinical practice and intervention for young adults with PLEs.

**Keywords:** Psychotic-like experiences, loneliness, social support

## **Introduction**

Individuals from the general population report psychotic-like experiences (PLEs) such as attenuated unusual perceptual experiences and beliefs, which have characteristics in common with hallucinations and delusions reported by patients with psychosis (Kelleher & Cannon, 2011; Nelson et al., 2012). It has become increasingly evident that PLEs are not limited to psychotic disorders (Johns & van Os, 2001). Rather, PLEs exist along a continuum ranging from no PLEs to increasing severity and persistent experiences among healthy individuals, through to those distressing symptoms reported in clinical populations (Unterrassner et al., 2017; van Os & Linscott, 2012). Lifetime prevalence for PLEs ranges from approximately 7% to 30% in the general population and are relatively common among young people (Linscott & van Os, 2013; McGrath et al., 2015). Given that the prevalence of PLEs is substantially higher than that of psychotic disorders (Moreno-Kustner et al., 2018; Perälä et al., 2007), there is an urgent call for researchers to look beyond the role of PLEs simply as risk indicators for later conversion to psychosis and examine the consequences of PLEs themselves in otherwise healthy individuals (Armando et al., 2010; Yung et al., 2009).

Regardless of the presence of psychiatric disorders, both adolescents and young adults with PLEs have poorer social and occupational functioning, even in comparison to individuals with diagnosed psychopathology but without PLEs (Brandizzi et al., 2014; Kelleher et al., 2015; Navarro-Mateu et al., 2017). Therefore, it is important to explore the relationship between PLEs and social outcomes. In addition to poor psychosocial functioning, people with psychosis also often report feelings of loneliness (Chrostek et al., 2016; Michalska da Rocha et al., 2018) and are particularly vulnerable to impoverished social support (Degnan et al., 2018; Norman et al., 2005). A deficiency in social support can be associated with feelings of loneliness. Loneliness is defined as a subjective and aversive

experience of social disconnection resulting from a perceived discrepancy between actual and desired social relationships (Hawkley & Cacioppo, 2010; Peplau, & Perlman, 1982).

However, studies report only a weak to moderate correlation between loneliness and the size of one's social network (Child & Lawton, 2019; Hawkley et al., 2003). In other words, individuals might be lonely even if they have a large network size, while others do not feel lonely despite only having a few confidantes. Loneliness can be a mild and transient experience for most people (Qualter et al., 2015). However, loneliness, like PLEs, is associated with a range of mental health disorders including depression, anxiety, and psychotic disorders (Ludwig et al., 2019; Meltzer et al., 2013). Over 80% of individuals with psychosis experience loneliness, report a need for more friends and loneliness as a major challenge to recovery (Morgan et al., 2012; Stain et al., 2012). Furthermore, increasing loneliness is associated with higher experiences of PLEs in individuals from the general population, even after controlling for sociodemographic factors, mental health status, and adverse childhood experiences (Chau et al., 2019; Narita et al., 2020).

However, the nature of the relationship between loneliness and PLEs remains poorly understood. While some research suggests that individuals with psychotic disorders experience stronger feelings of loneliness when compared to the general population (Chrostek et al., 2016) and identified loneliness as one of the greatest challenges to recovery (Morgan et al., 2012), others argued that loneliness can exacerbate psychotic experiences (Riggio, & Kwong, 2009). For instance, Hoffman's (2007) Social Deafferentation Hypothesis postulates that increasing loneliness is associated with the reorganisation of the brain regions involved in social cognition, which in turn increases vulnerability to hallucinations and delusions to compensate for the lack of social stimulation (Hoffman, 2007; Michael, & Park, 2016). It has been proposed that affective states, in particular depression and anxiety, might

explain the relationship between loneliness and psychosis (Jaya et al., 2017; Sundermann et al., 2014).

Besides feelings of loneliness, people with psychotic experiences often have limited social support (Norman et al., 2005). Social support has two components (Barrera, 1986): First, *received* social support captures the size of a social network as well as the frequency and availability of contact; second, *perceived* social support focuses on satisfaction with the availability and adequacy of social support (Kaul, & Lakey, 2003; Vangelisti, 2009). Interestingly, received, and perceived social support only correlate modestly (Haber et al., 2007; Lakey et al., 2009). Research suggests that lower subjective appraisal of social support, rather than received social support, has greater impact on the intensity of loneliness (Chrostek et al., 2016; Heinrich, & Gullone, 2006). In both first episode patients with psychosis and those from the general population who experience PLEs, people report a smaller social support network, lower frequency of contact, and less satisfaction with their social support (Gayer-Anderson, & Morgan, 2013; Song et al., 2011; Wiles et al., 2006). Although it is commonly agreed that reduced network size and low social support are consequences of psychotic disorders (Macdonald et al., 2000), recent evidence has reported diminishing social networks and support at first episode and prior to the onset of psychosis (Gayer-Anderson & Morgan, 2013; Horan et al., 2006). Consequently, since existing literature shows effects in both directions, it is important to investigate the potential bi-directional relationship between social factors and PLEs across time, and to clarify the direction of influence with the use of cross-lagged panel analysis.

Likewise, young adults with PLEs or who have a first-degree relative with a psychotic disorder report having fewer close friends, less diverse social networks, and less perceived social support (Robustelli et al., 2017). Young adulthood appears to represent a window of vulnerability for PLEs, establishing social networks and presence of mental health symptoms

(Gustavson et al., 2018; Trotta et al., 2020). Therefore, this study seeks to investigate the relationship between social factors and PLEs among young adults. Improving our understanding of the nature of loneliness, received and perceived social support, and their impact on PLEs is important for more effective interventions for individuals in this population (Cacioppo et al., 2015; Ma et al., 2019). Therefore, the primary aim of the current study is to explore the temporal relationship between these social factors and PLEs, over a period of three months. Based on prior findings we expect that higher levels of loneliness will be associated with lower levels of both received (i.e., number) and perceived (i.e., satisfaction) social support at each time point. Given that loneliness and perceived social support both focus on the subjective appraisal of social relationships, we hypothesise that loneliness will correlate more strongly with social support satisfaction as compared to social support number. It is expected that higher levels of PLEs will be associated with higher levels of loneliness but lower levels of received and perceived social support at each time point. We also expect baseline levels of (higher) loneliness and (lower) social support to predict future PLEs. However, as current findings on the temporal relationships between these factors is mixed, PLEs could also lead to feelings of loneliness and reduced social support. In addition, because depression and anxiety are closely associated with these social factors and PLEs, negative emotion states will be included as a controlled variable.

## **Methods**

### **2.1 Participants**

Based on the inclusion age criteria of 17-35 years and exclusion criteria of any psychiatric disorders, 175 participants (89.1% female) with a mean age of 20.05 years ( $SD = 3.19$ ) were included in data analysis. The present study is part of a longitudinal project

examining lifestyle, physical and mental health, and different aspects of functioning associated with schizotypy (N=951). Of these 951 participants, only 619 participants were approached to complete Time 2 measures, so that the 2<sup>nd</sup> time point fell within the academic semester. Time 1 measures were obtained from 619 undergraduates who were then invited to participate upon completion of their baseline response. Of the 619 emailed, only 196 people completed both time 1 and time 2.

## **2.2 Measures**

### *2.2.1 Community Assessment of Psychic Experiences- Brief (CAPE-P15; Capra, Kavanagh, Hides, & Scott, 2013)*

Adapted from the CAPE positive scale, CAPE-P15 is a self-report measure of subclinical positive psychotic-like experiences. CAPE-P15 has a stable three-factor structure, consisting of persecutory ideation, bizarre experiences, and perceptual abnormalities. The CAPE-15 measures the frequency (0=never to 3=nearly always) and level of distress (0=not distressed to 3=very distressed) related to PLEs, which produces a total score of 45 (Capra et al., 2017). The scale has adequate psychometric properties in terms of construct and clinical validity ( $r = 0.89$ ), high test-retest reliability (85%), and high levels of internal consistency ( $\alpha = 0.79$ ) (Sun, et al., 2020).

### *2.2.2 UCLA Loneliness Scale (Version 3; Russell, 1996)*

The UCLA is a 20-item self-report scale which measures the degree to which individuals feel connected to those around them. This scale places the emphasis on subjective appraisals of social connectedness with participants indicating frequency on a 4-point Likert

scale, ranging from “Never” to “Always” and has good psychometric properties (Vassar, & Crosby, 2008).

### *2.2.3 Social Support Questionnaire -Short Form (SSQ-6; Sarason et al., 1987)*

The SSQ-6 comprises 6 items and the responses to the SSQ-6 are used to derive: 1) a Number Score (SSQN), and 2) a Satisfaction Score (SSQS). The SSQN measures the number of available individuals that participants can turn to in different situations (range from 0 to 54). The second part of each item measures the individual’s degree of satisfaction with the support they receive. Participants rated their satisfaction on a 6-point Likert scale. The SSQ has shown high test-retest reliability, high internal consistency and convergent validity with other measures of social support. (O’Reilly, 1995).

### *2.2.5 Depression and Anxiety Stress Scale-21 (DASS-21; Henry & Crawford, 2005)*

DASS-21 is a 21-item self-report instrument to measure three negative emotional states. Participants respond on a 4-point Likert scale ranging from “Not at all” to “All or most of the time”. The DASS-21 has been shown to have strong internal consistency and discriminant validity (Osman et al., 2012).

## **2.3 Procedure**

All undergraduate participants signed up for the study through an online research platform and were directed to the survey link. Participants provided informed consent. Follow-up email reminders were sent to participants, and they could choose to complete the Time 2 questionnaire. Participants were awarded research credit points for their time and effort. This project received ethical approval through the Social Science Human Research Ethics Committee at the University of Wollongong.



## 2.4 Data Analysis

Pearson correlations were used to analyse the bivariate correlations among loneliness, social support number, social support satisfaction, and psychotic-like experiences across two time points. Second, paired sample *t*-tests were used to evaluate the stability of mean scores and correlations between social variables and psychotic-like experiences.

Third, cross-lagged panel analyses were performed to examine associations between loneliness, social support, and psychotic-like experiences, with four models. The classic two-wave cross-lagged panel design (0 and 3 month) incorporates:

- 1) cross-sectional correlations between loneliness, social support, and positive psychotic experiences at each time point, and

- 2) longitudinal effects of loneliness and social support at baseline on positive psychotic experiences over 3 months, and vice versa (Figure 1).

The cross-lagged panel analyses address the temporal order of effects by examining the predictive association between two variables over time while controlling for effects at an earlier time point. Model 1 included age, gender, and DASS scores as control variables and all pathways were examined. Model 2 tested Model 1 without covariates which were not significant. Model 3 tested for the temporal effect of loneliness, social support number, and social support satisfaction at Time 1 (T<sub>1</sub>) on psychotic-like experiences at Time 2 (T<sub>2</sub>). Model 4 was to test the effect of psychotic-like experiences at an earlier time point on subsequent loneliness, social support number, and social support satisfaction. The overall fit of the model was evaluated using both absolute and incremental fit indices: root-mean-square error of approximation (RMSEA), standardised root-mean-square residual (SRMR), and comparative fit index (CFI). A preferred model is the one with most indices meeting criteria of the suggested value.

## Results

The descriptive statistics and bivariate correlations for all variables are presented in Table 1. The pattern of correlations is in the expected directions. Cross-sectional correlations showed positive correlations between loneliness and psychotic-like experiences at both time points. Social support was negatively correlated with both loneliness and psychotic-like experiences.

Partial correlations were conducted to explore the relationship between loneliness and social support, while controlling for each subscale (i.e., Number and Satisfaction). The relationship between loneliness and social support satisfaction remained strong and negative,  $r(172) = -0.58, p < .001$ , indicating that controlling for social support number had little influence on the strength of the relationship between these two variables. However, the strong relationship between loneliness and social support number became moderate when controlling for social support satisfaction,  $r(172) = -0.39, p < .001$ , indicating the influence of social support satisfaction in this relationship.

Paired sample *t*-tests were conducted to examine if there were significant differences in scores between the two time points. There were no significant differences for loneliness ( $p = .76$ ) or social support satisfaction ( $p = .40$ ) across time. However, there was decrease in the number of social support and psychotic-like experiences with small effect sizes (Cohen's *d*) as shown in Table 2.

Finally, the cross-lagged models were run. Results for Model 1 indicate that age and gender were not significant, therefore were not included in subsequent models. DASS was significant and was included in Model 2 (see Table 5). However, DASS did not improve model fit for Model 3 and 4 and therefore was excluded. The standardised regression

coefficient suggests that although negative emotional state is associated with social factors, particularly loneliness, DASS scores did not influence the cross-lagged effects between these social factors and PLEs. Given that the test-retest correlation for DASS ( $r = .71, p < .001$ ) indicated scores were stable across the two time points and they did not affect the cross-lagged relationships, DASS was only controlled at baseline and not at follow up.

Fit statistics for Model 3 for *loneliness* demonstrated an excellent fit:  $\chi^2(1) = 1.559, p > .05, RMSEA = 0.057, SRMR = 0.021, CFI = 0.998$ .

Similarly, fit statistics for Model 3 for *social support number* demonstrated an excellent fit:  $\chi^2(1) = 1.120, p > .05, RMSEA = 0.026, SRMR = 0.021, CFI = 1.000$ .

Also, fit statistics for Model 4 for *social support satisfaction* demonstrated an excellent fit:  $\chi^2(1) = 0.113, p > .05, RMSEA = 0.000, SRMR = 0.007, CFI = 1.000$

The auto-regressive path was significant ( $p < .001$ ) for loneliness, social support number, social support satisfaction, and psychotic-like experiences for all models (Table 3).

For loneliness, after controlling the stability effects (i.e., the influence of loneliness at Time 1 on loneliness at Time 2 and the influence of PLEs at Time 1 on PLEs at Time 2), the cross-lagged effect of PLEs at Time 1 on loneliness Time 2 was not significant ( $p > .05$ ). However, the effect of loneliness at Time 1 on PLEs at Time 2 remained significant ( $p < .001$ ).

A cross-lagged effect was also significant for social support number at Time 1 on PLEs at Time 2 ( $p < .01$ ), however, the reverse effect was not significant ( $p > .05$ ). Higher social support number at Time 1 predicted lower ratings of PLEs at Time 2. There was no cross-lagged effect found between social support satisfaction and PLEs.

In summary, loneliness and social support number significantly predict subsequent PLEs. Social support satisfaction did not predict subsequent PLEs. PLEs at Time 1 did not predict subsequent feelings of loneliness, number of social support, or perceived satisfaction of social support. Therefore, the temporal effect of loneliness and social support for PLEs was significantly stronger and more robust than that of PLEs on these social variables.

## **Discussion**

All cross-sectional correlations between social factors and PLEs were in the predicted direction. First, individuals who reported greater feelings of loneliness tended to report less social support and were less satisfied with their social support in general. Further analyses revealed that the relationship between loneliness and satisfaction with social support remained strong when controlling for social support number. However, satisfaction with social support reduced the strength of relationship between loneliness and social support number. Loneliness and satisfaction only correlated moderately with social support, suggesting that while they might have some common elements, these constructs were targeting different aspects of an individual's social needs (Adamczyk, 2016; Ren, & Ji, 2019).

As hypothesised, young adults who reported higher levels of loneliness, less social support, and were less satisfied with their social support reported greater PLEs. These results are in line with previous findings of a relationship between higher levels of loneliness and PLEs in the general population (Granholm et al., 2020; Narita et al., 2020). Research using experience sampling method (ESM) capturing self-report of thoughts, mood and behaviours in the context of daily life has indicated that the absence of family members and

acquaintances increases risk of experiencing delusions in patients with schizophrenia (Myin-Germeys et al., 2001).

In our study, loneliness and satisfaction with social support remain stable over the three-month period, however both social support number and PLEs decreased. The sample comprised undergraduates, with the data collection period (i.e., 3-month period) approximately corresponding to the start and end of an academic session. Over this time, young adults might experience challenges such as adjusting to new social environments or coping with increasing educational demands (Miething, et al., 2016), therefore decreases in social support number could take place as a consequence of increasing demands. The finding of a decrease in PLEs is supported by existing research which suggests that PLEs are transitory in nature and do tend to fluctuate and remit over time (Debbane et al., 2013; Linscott, & van Os., 2013).

Although there has been much research concerning the co-occurrence of loneliness, poor social support, reduced social satisfaction, and PLEs, the nature of their temporal bi-directional relationships remains unclear (Michalska da Rocha et al., 2018). While some research postulates that PLEs lead to feelings of loneliness and fewer social supports (Riggio, & Kwong, 2009), other studies suggest these social factors predate the onset of psychotic experiences in both clinical and general population (Gayer-Anderson, & Morgan, 2013; Sundermann et al., 2013). The cross-lagged panel analyses in our study suggest greater feelings of loneliness and less social support predict more PLEs over time, but not the reverse. Our results, therefore, provide strong support for the hypothesis that loneliness and social support are implicated at earlier stages of psychosis risk. This also fits in with the Social Deafferentation hypothesis (Hoffman, 2007).

Although DASS was stable over time in our study and did not effect the cross lagged relationships, negative affect might also contribute to the pathway underlying the temporal relationship. Longitudinal studies suggest that loneliness predicts depression (Cacioppo et al., 2010; van Winkel et al., 2017), which has been consistently found to be a maintenance factor for PLEs (Jaya et al., 2017; Kramer et al., 2014). Nevertheless, it is important to note that in our study, although negative affective states were correlated with social factors and PLEs at baseline, they did not significantly impact on the temporal relationships tested. This is not surprising given that the measure used in this study reflects state, rather than trait-like negative affect. Perhaps using measures of temperament in future studies would yield different findings.

Our results also showed that the relationship between satisfaction with social support and PLEs was significant at each time point. This is in line with prior findings and emphasizes the importance of qualitative experiences of supportive relationships for current PLEs (Norman et al., 2005; Peng et al., 2019). However, unlike loneliness and social support number, satisfaction with social support did not have a temporal relationship with PLEs in the cross-lagged model. Satisfaction with social support was consistent across our two time points and as such represents a stable factor. This could indicate that satisfaction with social support is reflective of other cognitive processes involved in how people perceive their social environment. This finding requires further investigation to delineate the components of appraisal which shape social satisfaction.

Although the current study provides several contributions in understanding the temporal relationship between different social factors and PLEs among young adults, it is important to acknowledge its limitations. First, the sample comprises undergraduates and the majority are female, which might limit generalisability of results to the community population, other age groups or genders. Existing literature has established that social support

characteristics and social participation varies for different age groups (Child, & Lawton, 2019; Weiner et al., 2016). In addition, although the fit statistics suggest that our small sample size (N=175) was sufficient to produce a valid model based on a strong a priori theoretical framework (Iacobucci, 2009), a general guide for SEM analysis would suggest a minimum sample size of 200, therefore replication of these data is warranted. Secondly, the measures for satisfaction with social support is a general measure, it does not allow further interpretation of how individuals are satisfied with different sources of social support (i.e., friends, family, significant other). Given that perceived social support has been consistently found to be a protective factor against PLEs (Peng et al., 2019; Riches et al., 2018), future research should include multidimensional scales (e.g. Multi-dimensional Scale of Perceived Social Support; Zimet et al., 1988) to assess satisfaction with different sources of social support and explore their relationships with PLEs. Thirdly, it is important to note that cross-lagged panel analyses do not necessarily provide a model of causation (Hamaker et al., 2015). While our study demonstrates clear associations and temporal effects of our hypothesised predictive effects of social factors on PLEs, the existence of a third variable that is the underlying cause of both cannot be excluded.

Our findings corroborate those patterns observed in clinical samples, drawing attention to the role of social factors in understanding PLEs at a community level. Loneliness is frequently overlooked as a critical treatment target within psychosocial interventions which focus mainly on improving social skills (Addington et al., 2010; Kurtz, & Mueser, 2008). This emphasises the need for clinical research to recognise and distinguish both subjective feelings of social relationships and objective social support when developing effective support-related interventions for PLEs. Although subjective appraisal seems to be a component underlying both loneliness and satisfaction with social support, results indicate that they do not affect PLEs in similar ways. Therefore, further research is needed to

distinguish the conceptualisation of these constructs and not treat them synonymously. Most current interventions targeting loneliness and poor social support focus on older individuals (Dickens et al., 2011; Poscia et al., 2018). However, this study raises the significance and potential value of intervening early among young adults with PLEs as the negative impact of social factors on PLEs is evident in this population.

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Table 1. Means, standard deviations, and Pearson correlations.

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7
1. UCLA_T1	45.47	11.03							
2. UCLA_T2	45.29	11.07	0.76**						
3. SSQN_T1	3.94	1.97	-0.53**	-0.45**					
4. SSQN_T2	3.70	1.98	-0.46**	-0.52**	0.72**				
5. SSQS_T1	5.17	0.93	-0.60**	-0.47**	0.39**	0.30**			
6. SSQS_T2	5.11	0.98	-0.53**	-0.64**	0.33**	0.43**	0.55**		
7. CAPE_T1	7.06	5.44	0.34**	0.32**	-0.16*	-0.17*	-0.18*	-0.15*	
8. CAPE_T2	6.08	4.91	.039**	0.50**	-0.28**	-0.23**	-0.14	-0.29**	0.68**

*Note.* *M*= mean *SD*= standard deviation; UCLA= Loneliness Scale; SSQS=Social Support Questionnaire- Number subscale; SSQS= Social Support Questionnaire- Satisfaction subscale; CAPE= Community Assessment of Psychic Experiences- Brief; T1= Baseline; T2= 3 months follow up; \**p* <0.05; \*\**p* <0.001.



Table 2. Results of paired *t*-tests between time points for loneliness, social support, and psychotic-like experiences.

Variable	Mean difference	<i>SD</i>	95% CI for Mean difference		<i>t</i>	<i>d</i>
UCLA	0.18	7.68	-0.97	1.32	0.31	0.02
SSQN	0.24	1.47	0.02	0.46	2.15*	0.16
SSQS	0.06	0.91	-0.08	0.19	0.85	0.06
CAPE	0.98	4.14	0.36	1.60	3.12**	0.24

*Note.* \* $p < .05$ ; \*\* $p < .01$ .

Table 3. Auto-regressive and cross-lagged effects for loneliness, social support number, social support satisfaction, and psychotic-like experiences ( $N= 175$ ).

Effect	<i>B</i>	$\beta$		S. E
UCLA & CAPE				
(Model 3)				
T <sub>1</sub> _UCLA → T <sub>2</sub> _UCLA	.76	.76	***	.05
T <sub>1</sub> _CAPE → T <sub>2</sub> _CAPE	.54	.61	***	.05
T <sub>1</sub> _UCLA → T <sub>2</sub> _CAPE	.08	.19	**	.03
T <sub>1</sub> _CAPE → T <sub>2</sub> _UCLA	-	-	-	-
SSQN & CAPE				
(Model 3)				
T <sub>1</sub> _SSQN → T <sub>2</sub> _SSQN	.73	.72	***	.05
T <sub>1</sub> _CAPE → T <sub>2</sub> _CAPE	.60	.66	***	.05
T <sub>1</sub> _SSQN → T <sub>2</sub> _CAPE	-.43	-.17	**	.14

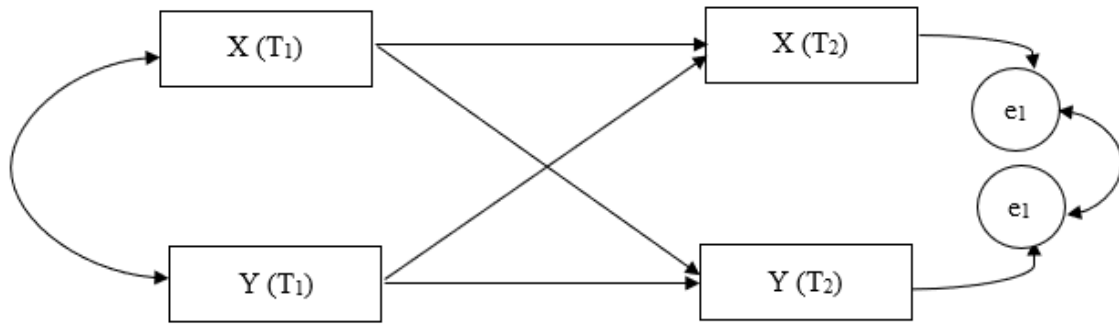
T <sub>1</sub> _CAPE → T <sub>2</sub> _SSQN			
	-	-	-
SSQS & CAPE	<i>B</i>	<i>β</i>	S. E
(Model 4)			
T <sub>1</sub> _SSQS → T <sub>2</sub> _SSQS	.56	.53	*** .06
T <sub>1</sub> _CAPE → T <sub>2</sub> _CAPE	.62	.68	*** .05
T <sub>1</sub> _SSQS → T <sub>2</sub> _CAPE	-	-	-
T <sub>1</sub> _CAPE → T <sub>2</sub> _SSQS	-.01	-.06	.01

**Note.** \*\**p* < 0.01; 8\*\*\**p* < 0.001. T<sub>1</sub>: Time 1; T<sub>2</sub>: Time 2. UCLA: Loneliness; SSQN: Social support number; SSQS: Social support satisfaction; CAPE: Psychotic-like experiences. *B*: regression coefficient; *β*: standardized regression coefficient; S. E: standard error. –: A path not included in that model.

Table 5. Auto-regressive effects for DASS as covariate ( $N= 175$ )

Effect	Model 1				Model 2			
	<i>B</i>	<i>B</i>		S. E	<i>B</i>	$\beta$		S. E
DASS → T <sub>1</sub> _UCLA	.44	.54	***	.05	.43	.54	***	.05
DASS → T <sub>1</sub> _CAPE	.18	.45	***	.03	.18	.45	***	.03
DASS → T <sub>1</sub> _SSQN	-.02	-.16	*	.01	-.02	-.16	*	.01
DASS → T <sub>1</sub> _CAPE	.18	.45	***	.03	.18	.45	***	.03
DASS → T <sub>1</sub> _SSQS	-0.3	-.38	***	.01	-.03	-.38	***	.01
DASS → T <sub>1</sub> _CAPE	.18	.45	***	.03	.18	.45	***	.03

Figure 1. A two-wave two-variable cross-lagged panel model.



*Note:* e1 represent error, T<sub>1</sub> and T<sub>2</sub> represent Time 1 and Time 2, respectively