Title:

The role of coping in the association between subclinical psychotic experiences and functioning: A within study replication in two independent adolescent samples

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Abstract

An inverse association between psychosocial functioning and psychotic experiences is now established in both clinical and non-clinical populations, however the mechanisms which drive this are unclear. Adolescents with subclinical psychotic experiences (SPE) are more likely to use maladaptive coping strategies and less likely to use adaptive ones, and maladaptive coping has also been associated with poor functioning. A within study replication in two adolescent samples from the general populations of Melbourne, Australia (n=723) and Birmingham, United Kingdom (n=239), was conducted to determine whether the association between SPE and psychosocial functioning is mediated by coping style.

SPE were associated with reduced general and family functioning and to a lesser extent with reduced peer functioning. Task-oriented (focusing on solving the problem) and emotion-oriented (negative emotional responses) coping were found to mediate the relationship between SPE and three types of functioning in both the Melbourne and the Birmingham samples.

The within study replication consistently found that coping style mediates SPE and psychosocial functioning, despite significant differences in age, gender, functioning, use of coping styles, and level of subclinical psychotic experiences between the two samples. Longitudinal research is needed to fully understand any causal role coping may play in the relationship between SPE and poor functioning. The results have important public health and clinical implications, and suggest that techniques which increase levels of adaptive coping and reduce levels of maladaptive coping (in particular emotion-oriented styles) may help to break the cycle between SPE, functional decline, and eventual need for care.

Keywords

Subclinical psychotic experiences; Psychotic-like experiences; Adolescence, Coping; Psychosocial functioning

1. Introduction

Subclinical psychotic experiences (attenuated, brief, or limited psychotic-like experiences) are present in approximately 5% of adults, 7.5% of adolescents, and 17% of children from the general population

(Kelleher, Connor, et al., 2012; Kelleher, Lynch, et al., 2012; van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009). The relationship between coping and psychotic experiences has been examined in populations with clinical psychotic disorder, individuals at Ultra High Risk (UHR) for psychosis (also known as clinical high risk and at-risk mental state; Yung, Phillips, Yuen, & McGorry, 2004), and non-clinical community samples with subclinical psychotic experiences.

Commonly, coping styles are categorised into adaptive strategies, including task-oriented coping (focusing on solving the problem or stressful situation), and maladaptive strategies, which include emotion-oriented (prominent negative emotional responses) and avoidance-oriented (engaging in distraction-based activities, or ignoring the problem) styles. Coping tends to occur as a conscious strategy to deal with stress, and can therefore be differentiated from defence mechanisms, which generally occur without conscious awareness (Cramer, 1998). Adolescents and young adults with subclinical psychotic experiences are more likely to use maladaptive coping strategies and less likely to use adaptive ones (Ered, Gibson, Maxwell, Cooper, & Ellman, 2017; Fonseca-Pedrero, Paino, Sierra-Baigrie, Lemos-Giráldez, & Muñiz, 2012; Lin et al., 2011). Maladaptive coping is associated with increased levels of psychotic experiences in both clinical (e.g. Jalbrzikowski et al., 2014; Kommescher et al., 2016; Lee et al., 2011; Phillips, Francey, Edwards, & McMurray, 2009; Ritsner & Ratner, 2006; Roe, Yanos, & Lysaker, 2006) and non-clinical (Ered et al., 2017; Fonseca-Pedrero et al., 2012; Lin et al., 2011) groups, while over time, adaptive coping predicts symptom reduction and psychosocial improvements (Jalbrzikowski et al., 2014).

This relationship between coping style and subclinical psychotic experiences appears to be bidirectional, with a study from Lin and colleagues (Lin et al., 2011) finding that greater use of maladaptive strategies were associated with an increase in subclinical psychotic experiences over time, and that higher levels of subclinical psychotic experiences at baseline were predictive of greater use of maladaptive coping at follow up. The bi-directional relationship found by Lin et al. suggests that maladaptive coping may play a role in the maintenance of psychotic experiences. This is important when considering community samples of adolescents, for although in the majority of young people these experiences are transitory (Zammit et al., 2004), in a minority they persist and may then be risk factors for clinical disorder (Dominguez, Wichers, Lieb, Wittchen, & van Os, 2011; Kaymaz et al., 2012; Poulton et al., 2000; van Os & Reininghaus, 2016; Werbeloff et al., 2012), as well as other adverse outcomes such as suicidal ideation and behaviour (Kelleher, Lynch, et al., 2012).

It has also been found that across the "extended psychosis phenotype" from subclinical experiences in the general population (Rössler et al., 2007; Yung et al., 2009) to clinical disorders such as schizophrenia (Kelleher et al., 2014; Yung et al., 1998), psychotic symptoms are associated with poor functioning. While low functioning is a poor outcome itself, it is also a risk factor for development of full blown psychotic disorder in those at UHR for psychosis (Yung et al., 2004). The mechanisms which drive the association between psychotic symptoms and functioning are currently unclear. In adolescent clinical samples with subclinical psychotic experiences, those with more maladaptive coping show the poorest functioning

(Wigman et al., 2014). Given that coping styles are potentially modifiable (Steinhardt & Dolbier, 2008), clarifying how coping may mediate the association between psychotic experiences/symptoms and functioning could provide an important avenue for psychosocial intervention. To date, however, the relationship between coping, psychotic experiences and psychosocial functioning has not been examined in community samples of young people.

Coping style has been found to vary in different age groups, genders (Hampel & Petermann, 2005), ethnicities (Bjorck, Cuthbertson, Thurman, & Lee, 2001), and cultures (Sica, Novara, Dorz, & Sanavio, 1997). In the current study we aimed to determine whether the association between subclinical psychotic experiences and psychosocial functioning is mediated by coping style. We conducted a within study replication, across two different countries, with a large general population adolescent sample from Australia, and a smaller general population adolescent sample from the UK.

2. Method

2.1 Participants and procedure:

Sample one; Melbourne, Australia: This sample comprised 723 adolescents recruited through secondary schools in Northern and Western Metropolitan Melbourne, Australia. Three data collection waves were conducted for this study (baseline, 12-month follow-up and three-year follow-up). Here we only report data from the baseline phase of the study. Students were assessed via questionnaires during school time. Trained research assistants were present to answer queries. Written informed consent was provided by all students and their parents. The study was approved by Research and Ethics Committees at the University of Melbourne, Victorian Department of Education and Catholic Education Office. A more detailed description of the sample is provided in Yung et al. (Yung et al., 2009).

Sample two; Birmingham, UK: This sample comprised 239 adolescents recruited though secondary schools in the West Midlands in the United Kingdom**.** Students completed a questionnaire during school time. Trained undergraduate psychology students were present to respond to any queries. Participation was voluntary and informed consent was obtained from all students and their parents. The study was approved by the Ethical Review Committee at the University of Birmingham.

2.2 Measures:

The Community Assessment of Psychic Experiences (CAPE; Konings, Bak, Hanssen, Van Os, & Krabbendam, 2006; Konings et al., 2012; Stefanis et al., 2002), a 42-item self-report questionnaire, was used to measure subclinical psychotic experiences on three subscales: positive, negative and depressive. Each item rates two aspects of psychotic experiences, namely the frequency and associated distress. As the risk for psychosis concept is predominantly based on the presence of positive psychotic experiences (Yung et al., 2004), here we report the positive subscale frequency score only which reports on positive

subclinical psychotic experiences (e.g. 'Do you ever hear voices when you are alone?'). The positive subscale is comprised of 20 items, which are scored on a four-point scale of 'never' (=1) to 'nearly always' (=4). Scores range from 20-80, with higher scores indicating a greater frequency of subclinical psychotic experiences.

Coping was assessed on the Coping Inventory for Stressful Situations (CISS; Endler & Parker, 1990), a 24 item scale which has previously been used with both adult and adolescent populations. Three different coping styles are measured on a five-point scale of 'not at all' (=1) to 'very much' (=5). Task-oriented coping ('When I encounter a difficult, stressful or upsetting situation I think about how I solved similar problems') refers to purposeful efforts aimed at solving the problem. Emotion-oriented coping ('When I encounter a difficult, stressful or upsetting situation I feel anxious about not being able to cope') describes self-oriented, predominantly negative, emotional reactions, self-preoccupation and fantasizing. Avoidance-oriented coping ('When I encounter a difficult, stressful or upsetting situation I treat myself to a favourite food or snack') refers to activities and cognitive changes intended to avoid the situation, including distraction techniques as well as social diversion (Endler & Parker, 1990). Higher subscale scores indicate a greater use of the coping style.

The Revised Multidimensional Assessment of Functioning Scale (RMAFS; Wardenaar et al., 2010) is a 23-item self-report questionnaire specifically designed to assess functioning in non-clinical adolescent populations. Three separate functional domains are produced which cover: Family functioning, including perceived family support ('I get on well with my parents'); peer functioning, including approval and peer support ('I feel close to my friends'); and general functioning, which covers a range of areas including school, physical health, life satisfaction and perceived achievements ('I am pleased with how my life is going'). Items are rated from 'not at all/rarely applicable' (=0) to '(almost) always applicable' (=5). Higher scores indicate better functioning.

2.3 Analyses:

Data was analysed using SPSS version 22. Because people with high levels of psychopathology tend to use more coping generally (Escher, Delespaul, Romme, Buiks, & Van Os, 2003), each score for coping was transformed into a proportion of overall coping used by the individual, following our previous methodology (Lin et al., 2011). Scores for each coping style were calculated as the sum of item scores per style. From this, the total amount of all coping styles used by the individual was calculated, and the proportional score for each coping style for each individual was then calculated as a percentage of this total score. All analyses utilised this proportional coping score.

In order to conduct a within study replication, data from Melbourne and Birmingham were analysed separately. Mediation analysis was conducted using the PROCESS macro for SPSS (Hayes, 2013), which estimates direct and indirect effects using a path analytical framework based on OLS regression models.

PROCESS involves bootstrapping the sampling distribution and provides confidence intervals for the indirect effect. CAPE positive score was entered as the predictor variable (x), with type of functioning as the dependent variable (y), and proportional coping style as the mediator (m). Due to multicollinearity, for each type of functioning, three regression analyses were conducted (one for each coping style). Age and gender were included in the analyses as covariates. As PROCESS provides 95% confidence intervals for the indirect effect rather than p-values (due to the bootstrapping method used), 95% confidence intervals rather than p-values are provided for these results (see Tables 2 and 3). Significant mediation is indicated if the indirect effect 95%CI range does not include zero.

The proportion of the relationship between SPE and functioning which was mediated by each coping style was calculated using the method outlined by Mascha et al. (2013), as follows: proportion of the total effect due to a specific mediator = indirect effect (mediation effect) / total effect.

3. Results:

3.1 Demographic data and comparison of the samples

Demographic data for the samples is presented in Table 1. The two samples differed significantly on a number of indices. The Birmingham sample was significantly older (mean age 16.10, SD 0.75) than the Melbourne sample (mean age 15.51, SD 0.41), as well as having more female participants and reported significantly better family functioning. The Birmingham sample had higher proportional use of emotion-oriented coping, while the Melbourne sample had significantly higher proportional use of task-oriented coping. CAPE positive scores were higher in the Melbourne sample. The groups did not differ significantly on general or peer functioning, or avoidance-oriented coping. Within the Melbourne sample, internal consistency for the CAPE positive was 0.85, and ranged from 0.86-0.93 for the CISS subscales, and 0.75-0.82 for the RMAFS subscales. Within the Birmingham sample internal consistency for the CAPE positive was 0.84, and ranged from 0.85-0.91 for the CISS subscales, and 0.73-0.78 for the RMAFS subscales.

Table 1 about here

3.2 Melbourne sample

Higher CAPE positive scores were found to be significantly associated with lower levels of general, family, and peer functioning (see Table 2). Figure 1 illustrates the different components of the mediation analysis.

Task-oriented coping: Task-oriented coping was found to partially mediate CAPE positive score with all three functional outcomes, indicated by a reduction of direct effect from total effect, and a significant indirect effect (see Table 2). The proportion of the relationship between SPE and functioning which was mediated by task-oriented coping was 0.37, 0.25, and 0.20 for general, family, and peer functioning respectively.

The indirect effect components (Table 3) indicate that higher CAPE positive scores were associated with significantly less use of task-oriented coping. Lower levels of task-oriented coping were significantly associated with lower levels of general, family, and peer functioning.

Emotion-oriented coping: Emotion-oriented coping was found to partially mediate CAPE positive scores with all three functional outcomes, indicated by a reduction of direct effect from total effect, and a significant indirect effect (see Table 2). The proportion of the relationship between SPE and functioning which was mediated by emotion-oriented coping was 0.48 for general, 0.33 for family, and 0.50 for peer functioning.

The indirect effect components indicate that higher CAPE positive scores were associated with significantly more use of emotion-oriented coping. Higher levels of emotion-oriented coping were significantly associated with lower levels of general, family, and peer functioning (see Table 3).

Avoidance-oriented coping: Avoidance-oriented coping was found to partially mediate CAPE positive with peer functioning (although with a particularly low beta for the indirect mediation effect). The proportion of the relationship between SPE and peer functioning which was mediated by avoidance-oriented coping was 0.10. The indirect effects for general and family functioning were not found to be significant, indicating that avoidance-oriented coping did not significantly mediate general or family functioning (see Table 2).

The indirect effect components (Table 3) indicate that higher CAPE positive scores were associated with significantly less use of avoidance-oriented coping. Higher levels of avoidance-oriented coping were associated with higher levels of peer functioning. Avoidance-oriented coping was not significantly associated with general or family functioning.

Figure 1 about here

3.3 Birmingham sample

Higher CAPE positive scores were found to be significantly associated with lower levels of all three functional outcomes (see Table 2).

Task-oriented coping: Task-oriented coping was found to fully mediate CAPE positive scores with peer functioning, indicated by a non-significant direct effect, and a significant indirect effect. Task-oriented coping was found to partially mediate CAPE positive scores with general and family functioning (see Table 2). The proportion of the relationship between SPE and functioning which was mediated by task-oriented coping was 0.58 for general, 0.27 for family, and 0.33 for peer functioning.

The indirect effect components indicate that higher CAPE positive scores were associated with significantly less use of task-oriented coping. Lower levels of task-oriented coping were significantly associated with lower levels of all three types of functioning (see Table 3).

Emotion-oriented coping: Emotion-oriented coping was found to fully mediate CAPE positive with both general and peer functioning, and partially mediate CAPE positive and family functioning (see Table 2). The proportion of the relationship between SPE and functioning which was mediated by emotion-oriented coping was 0.75, 0.32, and 0.88 for general, family, and peer functioning respectively.

The indirect effect components indicate that higher CAPE positive scores were associated with significantly more use of emotional-oriented coping. Higher levels of emotion-oriented coping were significantly associated with lower levels of general, family, and peer functioning (see Table 3).

Avoidance-oriented coping: Avoidance-oriented coping was found to partially mediate CAPE positive with peer functioning. The proportion of the relationship between SPE and peer functioning which was mediated by avoidance-oriented coping was 0.22. Avoidance-oriented coping was not found to mediate CAPE positive with general or family functioning (see Table 2).

The indirect effect components indicate that higher CAPE positive scores were associated with significantly less avoidance-oriented coping. No association was found between avoidance based coping and general and family functioning. Higher levels of avoidance-oriented coping were associated with higher levels of peer functioning (see Table 3).

Table 2 about here

Table 3 about here

4. Discussion

The aim of the current study was to determine whether the association between subclinical psychotic experiences and psychosocial functioning is mediated by coping style. This was explored in a within study replication utilising two adolescent samples from the general populations of Australia and the United Kingdom. Despite the samples coming from two different countries, and differing significantly in terms of age, gender, functioning, use of coping styles, and level of subclinical psychotic experiences, the results were very consistent between the samples. Subclinical psychotic experiences were associated with reduced general, family, and peer functioning in both samples. Both task-oriented coping and emotion-oriented coping were found to partially or fully mediate the association between subclinical psychotic experiences and functioning. In particular, emotion-oriented coping was found to fully mediate the association between subclinical psychotic experiences with both general and peer functioning in the Birmingham sample. This was driven by higher subclinical psychotic experiences being associated with increased levels of emotion-oriented coping, which was in turn associated with reduced functioning. Task-oriented coping was also found to fully mediate the association between subclinical psychotic experiences and peer functioning in the Birmingham sample, with higher levels of subclinical psychotic experiences associated with reduced task-oriented coping and reduced functioning.

Typically, coping is categorised into adaptive (also called positive and approach-oriented) or maladaptive (negative, avoidance-oriented) styles. The CISS further categorises maladaptive coping into emotion-oriented and avoidance-oriented methods. Previously, research using two-factor models of coping (adaptive and maladaptive) has found that maladaptive coping is associated with psychotic experiences in adolescents with non-psychotic psychiatric disorders (Wigman et al., 2014), and that non-clinical adolescents with subclinical psychotic experiences use more maladaptive strategies and fewer adaptive coping strategies (Fonseca-Pedrero et al., 2012). Our findings suggest that if maladaptive coping is further broken down into emotional and avoidance styles, then these previous findings may be driven more by the emotional aspects of maladaptive styles rather than the avoidance or disengagement aspects.

It is noteworthy that avoidant coping styles were not found to be maladaptive in this population. This was driven by both elements of the indirect effect; higher subclinical psychotic experiences were associated with *reduced* levels of avoidance-oriented coping, and avoidance-oriented coping was associated with *higher* levels of peer functioning in both samples. The CISS avoidance subscale includes 'disengagement styles' of avoidance (e.g. 'When I encounter a difficult, stressful, or upsetting situation I treat myself to my favourite food or snack') as well as avoidance via social diversion (e.g. 'When I encounter a difficult,

stressful, or upsetting situation I visit a friend'). Although further research is needed, it seems likely that it is this second type of avoidance strategy which may drive the positive association found between avoidance-oriented coping and peer functioning in the two samples, and suggests that in adolescents from the general population this type of avoidant-oriented coping may actually be adaptive. This mirrors previous research in adolescent and young adult populations which has found that avoidance-oriented coping (measured by the CISS) is positively correlated with social relationships (Pisula, Lukowska, & Fudalej, 2014).

The results of this study contribute to a growing literature which highlights the importance of coping strategies within the psychosis continuum. Wigman et al. (2014) examined whether coping may moderate the relationship between subclinical psychotic experiences and functioning. Although maladaptive coping and poorer functioning were both associated with increased subclinical psychotic experiences, no evidence of a moderating effect of coping was found. This, in combination with the current research suggests that coping may be a mediating factor (a factor which explains or accounts for the relationship between two variables) rather than a moderating one (a factor which affects the strength or direction of a relationship between two variables), with coping style playing a potentially causal role in explaining the association between psychosocial functioning and (subthreshold) psychotic experiences. In a sample of undergraduate students, Ered et al. (2017) found that coping mediated the relationship between traumatic life events and subclinical psychotic experiences, as well as the relationship between high levels of stress and subclinical psychotic experiences. Taken together with the finding of a bi-directional relationship between coping and subclinical psychotic experiences from Lin and colleagues (2011), this is suggestive that inadequate coping may contribute to perpetuating psychotic experiences. The current study, in addition, suggests that this cycle of inadequate coping skills and subclinical psychosis experiences may also lead to reduced functioning.

The results of the study should be interpreted considering the following strengths and limitations. To our knowledge this is the first study to investigate the potential mediating role of coping in the association between subclinical psychotic experiences and functioning. The within study replication design, utilising two relatively large samples of adolescents from two different countries, represents a strength of the study. The samples differed on a number of factors which have been shown to effect coping style, including culture, gender, and age (Bjorck et al., 2001; Hampel & Petermann, 2005; Sica et al., 1997), and yet the βs and 95% CIs were remarkably consistent between the two samples, suggesting that the results have high generalisability within high income and western countries. Further research is needed to explore the role coping may play in low and middle income, and non-western countries. A limitation of the study is its cross-sectional nature, which reduces the conclusions which can be drawn; further longitudinal research is required to fully understand any potential causal relationships. The use of mediation analyses with cross-sectional data has been criticised (Maxwell & Cole, 2007; Maxwell, Cole, & Mitchell, 2011). Hayes and Rockwood (2017) argue, however, that the use of mediation analysis with cross-sectional data

is an important tool for understanding potential relationships between variables, and provides a vital step in guiding novel or early stage research prior to larger longitudinal studies. The CAPE has been found to be a reliable and valid measure of subclinical psychotic experiences, however it should be noted that it was not designed with the intention of screening for psychotic disorders (Konings et al., 2006). Although individuals who experience subclinical psychotic experiences have an increased risk of developing psychosis (Dominguez et al., 2011; Kaymaz et al., 2012; Poulton et al., 2000; van Os & Reininghaus, 2016; Werbeloff et al., 2012), they should not be conflated with the UHR for psychosis population, and therefore future research should investigate whether coping may mediate the relationship between psychotic experiences and functioning in other at-risk populations. Laurens et al. (2007) found only moderate agreement between self-reported and interviewer rated evaluations of SPE, however, Konings et al. (2006) report a moderately strong association between the CAPE and interviewer-rated assessments. In addition, a number of other studies have found that self-report questionnaires can be a reliable way of assessing SPE (Allardyce, Suppes, & van Os, 2007; Kelleher, Harley, Murtagh, & Cannon, 2009). Functioning and coping were also both assessed via self-report measures. Whilst self-report measures represent a practical way of collecting data, it is important to acknowledge the limitations of this method. For example, different participants may have had different frames of reference for what constitutes good functioning, and this may have lowered reliability of measurements between participants. Surveys were completed during class time by all students in attendance that had parental consent to take part. Data was not collected on the number of adolescents who were not in attendance on the day the survey was conducted or whose parents did not consent to them participating. As a convenience sample, this may have resulted in potential biases within the research, for example, if data were not missing at random. Finally, another factor not examined in this paper is the different subtypes of psychotic experiences, such as bizarre experiences, persecutory ideas, perceptual abnormalities and magical thinking. Future research should investigate to what extent coping varies across these subtypes.

Given that 17% of children and 7.5% of adolescents experience subclinical psychotic experiences, and that these experiences are associated with reduced functioning, high levels of distress, and suicidal ideation (Kelleher, Lynch, et al., 2012), introducing classroom-based learning about coping strategies in schools may encourage the adoption of more positive coping strategies (or reduce adoption of negative coping strategies) earlier in life. Adoption of more positive coping strategies may also prove effective for other symptoms (McWilliams, Cox, & Enns, 2003) or even general stress related factors (Pisula et al., 2014) that play a role in young people's daily lives. Additionally, whilst further longitudinal research is needed, the findings of the present study have important clinical treatment implications, as they suggest that techniques which increase levels of adaptive coping and reduce levels of maladaptive coping (in particular emotion-oriented styles) may help to break the vicious cycle between subclinical psychotic experiences, functional decline, and eventual need for care.

5. References

Allardyce, J., Suppes, T., & van Os, J. (2007). Dimensions and the psychosis phenotype. *International journal of methods in psychiatric research, 16*(S1), S34-S40.

Bjorck, J. P., Cuthbertson, W., Thurman, J. W., & Lee, Y. S. (2001). Ethnicity, coping, and distress among Korean Americans, Filipino Americans, and Caucasian Americans. *The Journal of social psychology, 141*(4), 421-442.

Cramer, P. (1998). Coping and defense mechanisms: What's the difference? *Journal of Personality, 66*(6), 919-946.

Dominguez, M., Wichers, M., Lieb, R., Wittchen, H. U., & van Os, J. (2011). Evidence that onset of clinical psychosis is an outcome of progressively more persistent subclinical psychotic experiences: an 8-year cohort study. *Schizophrenia Bulletin, 37*(1), 84-93.

Endler, N. S., & Parker, J. D. (1990). Multidimensional assessment of coping: a critical evaluation. *Journal of Personality and Social Psychology, 58*(5), 844-854.

Ered, A., Gibson, L., Maxwell, S., Cooper, S., & Ellman, L. (2017). Coping as a mediator of stress and psychotic-like experiences. *European Psychiatry, 43*, 9-13.

Escher, S., Delespaul, P., Romme, M., Buiks, A., & Van Os, J. (2003). Coping defence and depression in adolescents hearing voices. *Journal of Mental Health, 12*(1), 91-99.

Fonseca-Pedrero, E., Paino, M., Sierra-Baigrie, S., Lemos-Giráldez, S., & Muñiz, J. (2012). Psychotic-like experiences, emotional and behavioral problems and coping strategies in nonclinic adolescents. *Anuario de psicología, 42*(3).

Hampel, P., & Petermann, F. (2005). Age and gender effects on coping in children and adolescents. *Journal of Youth and Adolescence, 34*(2), 73-83.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*: Guilford Press.

Hayes, A. F., & Rockwood, N. J. (2017). Regression-based statistical mediation and moderation analysis in clinical research: Observations, recommendations, and implementation. *Behaviour research and therapy, 98*, 39-57.

Jalbrzikowski, M., Sugar, C. A., Zinberg, J., Bachman, P., Cannon, T. D., & Bearden, C. E. (2014). Coping styles of individuals at clinical high risk for developing psychosis. *Early Intervention in Psychiatry, 8*(1), 68-76.

Kaymaz, N., Drukker, M., Lieb, R., Wittchen, H.-U., Werbeloff, N., Weiser, M., . . . Van Os, J. (2012). Do subthreshold psychotic experiences predict clinical outcomes in unselected non-help-seeking population-based samples? A systematic review and meta-analysis, enriched with new results. *Psychological Medicine, 42*(11), 2239-2253.

Kelleher, I., Connor, D., Clarke, M. C., Devlin, N., Harley, M., & Cannon, M. (2012). Prevalence of psychotic symptoms in childhood and adolescence: a systematic review and meta-analysis of population-based studies. *Psychological Medicine, 42*(9), 1857-1863.

Kelleher, I., Devlin, N., Wigman, J. T., Kehoe, A., Murtagh, A., Fitzpatrick, C., & Cannon, M. (2014). Psychotic experiences in a mental health clinic sample: implications for suicidality, multimorbidity and functioning. *Psychological Medicine, 44*(8), 1615-1624.

Kelleher, I., Harley, M., Murtagh, A., & Cannon, M. (2009). Are screening instruments valid for psychotic-like experiences? A validation study of screening questions for psychotic-like experiences using in-depth clinical interview. *Schizophrenia Bulletin, 37*(2), 362-369. doi:doi: 10.1093/schbul/sbp057

Kelleher, I., Lynch, F., Harley, M., Molloy, C., Roddy, S., Fitzpatrick, C., & Cannon, M. (2012). Psychotic symptoms in adolescence index risk for suicidal behavior: findings from 2 population-based case-control clinical interview studies. *Archives of general psychiatry, 69*(12), 1277-1283.

Kommescher, M., Wagner, M., Pützfeld, V., Berning, J., Janssen, B., Decker, P., . . . Maier, W. (2016). Coping as a predictor of treatment outcome in people at clinical high risk of psychosis. *Early Intervention in Psychiatry, 10*(1), 17-27.

Konings, M., Bak, M., Hanssen, M., Van Os, J., & Krabbendam, L. (2006). Validity and reliability of the CAPE: a self-report instrument for the measurement of psychotic experiences in the general population. *Acta Psychiatrica Scandinavica, 114*(1), 55-61.

Konings, M., Stefanis, N., Kuepper, R., de Graaf, R., Have, M., van Os, J., . . . Henquet, C. (2012). Replication in two independent population-based samples that childhood maltreatment and cannabis use synergistically impact on psychosis risk. *Psychological Medicine, 42*(1), 149.

Laurens, K. R., Hodgins, S., Maughan, B., Murray, R. M., Rutter, M. L., & Taylor, E. A. (2007). Community screening for psychotic-like experiences and other putative antecedents of schizophrenia in children aged 9–12 years. *Schizophrenia Research, 90*(1), 130-146.

Lee, S. Y., Kim, K. R., Park, J. Y., Park, J. S., Kim, B., Kang, J. I., . . . Kwon, J. S. (2011). Coping strategies and their relationship to psychopathologies in people at ultra high-risk for psychosis and with schizophrenia. *The Journal of nervous and mental disease, 199*(2), 106-110.

Lin, A., Wigman, J., Nelson, B., Vollebergh, W., van Os, J., Baksheev, G., . . . Yung, A. (2011). The relationship between coping and subclinical psychotic experiences in adolescents from the general population–a longitudinal study. *Psychological Medicine, 1*(1), 1-12.

Mascha, E. J., Dalton, J. E., Kurz, A., & Saager, L. (2013). Understanding the mechanism: Mediation analysis in randomized and nonrandomized studies. *Anesthesia & Analgesia, 117*(4), 980-994.

Maxwell, S. E., & Cole, D. A. (2007). Bias in cross-sectional analyses of longitudinal mediation. *Psychological methods, 12*(1), 23.

Maxwell, S. E., Cole, D. A., & Mitchell, M. A. (2011). Bias in cross-sectional analyses of longitudinal mediation: Partial and complete mediation under an autoregressive model. *Multivariate Behavioral Research, 46*(5), 816-841.

McWilliams, L. A., Cox, B. J., & Enns, M. W. (2003). Use of the Coping Inventory for Stressful Situations in a clinically depressed sample: Factor structure, personality correlates, and prediction of distress. *Journal of Clinical Psychology, 59*(4), 423-437.

Phillips, L., Francey, S., Edwards, J., & McMurray, N. (2009). Strategies used by psychotic individuals to cope with life stress and symptoms of illness: a systematic review. *Anxiety, Stress & Coping, 22*(4), 371-410.

Pisula, E., Lukowska, E., & Fudalej, P. S. (2014). Self-esteem, coping styles, and quality of life in polish adolescents and young adults with unilateral cleft lip and palate. *The Cleft Palate-Craniofacial Journal, 51*(3), 290-299.

Poulton, R., Caspi, A., Moffitt, T. E., Cannon, M., Murray, R., & Harrington, H. L. (2000). Children's self-reported psychotic symptoms and adult schizophreniform disorder: a 15-year longitudinal study. *Archives of general psychiatry, 57*(11), 1053-1058.

Ritsner, M. S., & Ratner, Y. (2006). The long-term changes in coping strategies in schizophrenia: temporal coping types. *The Journal of nervous and mental disease, 194*(4), 261-267.

Roe, D., Yanos, P. T., & Lysaker, P. H. (2006). Coping with psychosis: an integrative developmental framework. *The Journal of nervous and mental disease, 194*(12), 917.

Rössler, W., Riecher-Rössler, A., Angst, J., Murray, R., Gamma, A., Eich, D., . . . Gross, V. A. (2007). Psychotic experiences in the general population: a twenty-year prospective community study. *Schizophrenia Research, 92*(1), 1-14.

Sica, C., Novara, C., Dorz, S., & Sanavio, E. (1997). Coping strategies: Evidence for cross-cultural differences? A preliminary study with the Italian version of coping orientations to problems experienced (COPE). *Personality and Individual Differences, 23*(6), 1025-1029.

Stefanis, N., Hanssen, M., Smirnis, N., Avramopoulos, D., Evdokimidis, I., Stefanis, C., . . . Van Os, J. (2002). Evidence that three dimensions of psychosis have a distribution in the general population. *Psychological Medicine, 32*(2), 347-358.

Steinhardt, M., & Dolbier, C. (2008). Evaluation of a resilience intervention to enhance coping strategies and protective factors and decrease symptomatology. *Journal of American college health, 56*(4), 445-453.

van Os, J., Linscott, R. J., Myin-Germeys, I., Delespaul, P., & Krabbendam, L. (2009). A systematic review and meta-analysis of the psychosis continuum: evidence for a psychosis proneness-persistence-impairment model of psychotic disorder. *Psychological Medicine, 39*(02), 179-195. doi:doi:10.1017/S0033291708003814

van Os, J., & Reininghaus, U. (2016). Psychosis as a transdiagnostic and extended phenotype in the general population. *World Psychiatry, 15*(2), 118-124.

Wardenaar, K. J., van Veen, T., Giltay, E. J., de Beurs, E., Penninx, B. W., & Zitman, F. G. (2010). Development and validation of a 30-item short adaptation of the Mood and Anxiety Symptoms Questionnaire (MASQ). *Psychiatry Research, 179*(1), 101-106.

Werbeloff, N., Drukker, M., Dohrenwend, B. P., Levav, I., Yoffe, R., van Os, J., . . . Weiser, M. (2012). Self-reported Attenuated Psychotic Symptoms as Forerunners of Severe Mental Disorders Later in Life. *Arch Gen Psychiatry, 69*(5), 467-475. doi:10.1001/archgenpsychiatry.2011.1580

Wigman, J. T., Devlin, N., Kelleher, I., Murtagh, A., Harley, M., Kehoe, A., . . . Cannon, M. (2014). Psychotic symptoms, functioning and coping in adolescents with mental illness. *BMC psychiatry, 14*(1), 97.

Yung, A., Phillips, L., McGorry, P., McFarlane, C., Francey, S., Harrigan, S., . . . Jackson, H. (1998). Prediction of psychosis: a step towards indicated prevention of schizophrenia. *The British Journal of Psychiatry, 172*(Suppl. 33), 14-20.

Yung, A., Phillips, L., Yuen, H., & McGorry, P. (2004). Risk factors for psychosis in an ultra high-risk group: psychopathology and clinical features. *Schizophrenia Research, 67*, 131-142.

Yung, A. R., Nelson, B., Baker, K., Buckby, J. A., Baksheev, G., & Cosgrave, E. M. (2009). Psychotic-like experiences in a community sample of adolescents: implications for the continuum model of psychosis and prediction of schizophrenia. *Australian and New Zealand Journal of Psychiatry, 43*(118-128).

Zammit, S., Allebeck, P., David, A. S., Dalman, C., Hemmingsson, T., Lundberg, I., & Lewis, G. (2004). A longitudinal study of premorbid IQ score and risk of developing schizophrenia, bipolar disorder, severe depression, and other nonaffective psychoses. *Archives of general psychiatry, 61*(4), 354-360. doi:10.1001/archpsyc.61.4.354

Table 1. Demographic characteristics of the Melbourne and Birmingham samples

	Birmingham			**Melbourne**			**Statistics**		
		N	**%**		**N**	**%**	**Chi-**	**df**	**p-value**
Female gender		147	61.51		391	54.08	4.02	1	0.045
	N	**M**	**SD**	**N**	**M**	**SD**	**t-score**	**df**	**p-value**
Age	239	16.10	0.75	723	15.51	0.41	-11.69	287.20	<0.001
CAPE Positive	239	30.55	6.69	723	31.55	7.09	1.93	960	0.05
General functioning RMAFS	233	30.33	5.07	719	30.71	5.25	0.97	950	0.3
Peer functioning RMAFS	236	18.65	3.18	722	18.95	3.64	1.19	452.23	0.2
Family functioning RMAFS	239	23.05	3.90	720	20.82	3.41	-7.87	366.23	<0.001

Task-oriented coping CISS (% of total coping)	239	32.82	6.91	723	35.64	7.19	5.30	960	<0.001
Emotion-oriented coping CISS (% of total coping)	239	31.06	7.81	723	28.59	7.92	-4.18	960	<0.001
Avoidance-oriented coping CISS (% of total coping)	239	36.12	6.23	723	35.77	6.41	-0.74	960	0.5

Table 2: The relationship between CAPE positive and functioning type, mediated by coping style

Relationship without mediating variable			**Impact of Coping style (M)**				
	Total effect of CAPE (X) on Functioning (Y)		**Direct effect of CAPE (X) on Functioning (Y)**			**Indirect effect of CAPE (X) on Functioning (Y)**	
	β	**95% CI**		**β**	**95% CI**	**β**	**95% CI**
Melbourne Sample;							
General Functioning	-.27	**-.32, -.22***	CISS Task	-.17	**-.22, -.13***	-.10	**-.13,-.07***
			CISS Emotional	-.14	**-.19, -.09***	-.13	**-.16, -.10***
			CISS Avoidance	-.28	**-.33, -.22***	-.01	-.003, .02
Family Functioning	-.12	**-.15, -.08***	CISS Task	-.08	**-.12,-.05***	-.03	**-.05,-.02***
			CISS Emotional	-.08	**-.11,-.04***	-.04	**-.06,-.02***
			CISS Avoidance	-.12	**-.15, -.08***	.004	-.003, .01
Peer Functioning	-.10	**-.14, -.06***	CISS Task	-.08	**-.12, -.04***	-.02	**-.03, -.01***
			CISS Emotional	-.05	**-.09, -.01***	-.05	**-.07, -.03***
			CISS Avoidance	-.09	**-.13, -.05***	-.01	**-.02, -.004***
Birmingham Sample;							
General Functioning	-.24	**-.33, -.14***	CISS Task	-.10	**-.19, -.02***	-.14	**-.19, -.09***
			CISS Emotional	-.06	-.15, .03	-.18	**-.25, -.12***
			CISS Avoidance	-.24	**-.34 -.14***	.002	-.02 .02
Family Functioning	-.22	**-.29, -.15***	CISS Task	-.16	**-.23, -.09***	-.06	**-.10, -.03***
			CISS Emotional	-.15	**-.23, -.07***	-.07	**-.11, -.03***
			CISS Avoidance	-.22	**-.30, -.15***	.005	-.006, .02
Peer Functioning	-.09	**-.15, -.03***	CISS Task	-.06	-.12, .003	-.03	**-.05,-.007***
			CISS Emotional	-.01	-.07, .05	-.08	**-.12, -.05***
			CISS Avoidance	-.07	**-.13, -.01***	-.02	**-.04, -.004***

Predictor variable (X = CAPE P), mediator variable (M= Proportional Coping type; Task. Emotional, or Avoidance) and outcome variable (Y = Functioning type; General, Family, or Peer)
*significant association based on 95%CI

Table 3: Components of indirect effects

Effect of CAPE (X) on Coping (M)			**Effect of Coping (M) on Functioning (Y)**		
	β	**95% CI**		**β**	**95% CI**
Melbourne Sample					
CISS Task	-.26	**-.33, -.19***	General Functioning	.37	**.32, .41***
			Family Functioning	.12	**.09, .16***
			Peer Functioning	.07	**.03, .11***
CISS Emotional	.42	**.35, .50***	General Functioning	-.31	**-.35 -.26***
			Family Functioning	-.10	**-.13,-.06***
			Peer Functioning	-.11	**-.15, -.08***
CISS Avoidance	-.16	**-.23, -.10***	General Functioning	-.04	-.09, .02
			Family Functioning	-.02	-.06, .02

			Peer Functioning	.07	**.03, .11***
Birmingham Sample					
CISS Task	-.26	**-.33, -.19***	General Functioning	.39	**.31, .47***
			Family Functioning	.17	**.10, .24***
			Peer Functioning	.08	**.02 .14***
CISS Emotional	.42	**.34, .49***	General Functioning	-.34	**-.42, -.26***
			Family Functioning	-.13	**-.20, -.06***
			Peer Functioning	-.15	**-.21, -.10***
CISS Avoidance	-.16	**-.22, -.09***	General Functioning	-.01	-.11, .09
			Family Functioning	-.03	-.10, .05
			Peer Functioning	.10	**.04 .17***

Predictor variable (X = CAPE P), mediator variable (M= Proportional Coping type; Task. Emotional, or Avoidance) and outcome variable (Y = Functioning type; General, Family, or Peer)
*significant association based on 95%CI