

Author's Accepted Manuscript

Perceived Ethnic Discrimination and Persecutory Paranoia in individuals at ultra-high risk for psychosis

Madiha Shaikh, Lyn Ellett, Anirban Dutt, Fern Day, Jennifer Laing, Jasmine Kroll, Sabrina Petrella, Philip McGuire, Lucia R. Valmaggia



PII: S0165-1781(15)30481-9
DOI: <http://dx.doi.org/10.1016/j.psychres.2016.05.006>
Reference: PSY9692

To appear in: *Psychiatry Research*

Received date: 7 October 2015
Revised date: 2 May 2016
Accepted date: 4 May 2016

Cite this article as: Madiha Shaikh, Lyn Ellett, Anirban Dutt, Fern Day, Jennifer Laing, Jasmine Kroll, Sabrina Petrella, Philip McGuire and Lucia R. Valmaggia Perceived Ethnic Discrimination and Persecutory Paranoia in individuals at ultra high risk for psychosis, *Psychiatry Research* <http://dx.doi.org/10.1016/j.psychres.2016.05.006>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain

Perceived Ethnic Discrimination and Persecutory Paranoia in individuals at ultra-high risk for psychosis

Madiha Shaikh^{a,d}, Lyn Ellett^c, Anirban Dutt^a, Fern Day^{a,b}, Jennifer Laing^b, Jasmine Kroll^a, Sabrina Petrella^a, Philip McGuire^{a,b}, Lucia R. Valmaggia^{a,b}

a. King's College London, Institute of Psychiatry, Psychology & Neuroscience, London, United Kingdom

b. South London and Maudsley NHS Foundation Trust, London, United Kingdom

c. Department of Psychology, Royal Holloway, University of London, London, United Kingdom

d. North East London NHS Foundation Trust, London, United Kingdom

*Correspondence to: Dr Madiha Shaikh, Redbridge Psychology Department Goodmayes Hospital, North East London NHS Foundation Trust, London, United Kingdom, IG3 8XJ

E-mail: madiha.shaikh@nelft.nhs.uk

Abstract

Despite a consensus that psychosocial adversity plays a role in the onset of psychosis, the nature of this role in relation to persecutory paranoia remains unclear. This study examined the complex relationship between perceived ethnic discrimination and paranoid ideation in individuals at Ultra High Risk (UHR) for psychosis using a virtual reality paradigm to objectively measure paranoia. Data from 64 UHR participants and 43 healthy volunteers were analysed to investigate the relationship between perceived ethnic discrimination and persecutory ideation in a virtual reality environment. Perceived ethnic discrimination was higher in young adults at UHR in comparison to healthy controls. A positive correlation was observed between perceived ethnic discrimination and paranoid persecutory ideation in the whole sample. Perceived ethnic discrimination was not a significant predictor of paranoid persecutory ideation in the VR environment. Elevated levels of perceived ethnic discrimination are present in individuals at UHR and are consistent with current biopsychosocial models in which psychosocial adversity plays a key role in the development of psychosis and attenuated symptomatology.

Key words

paranoia; psychosis; perceived ethnic discrimination; ultra high risk; schizophrenia; prodrome; virtual reality; psychosocial.

1. Introduction

Previous studies have shown the importance of social discrimination in increasing the vulnerability to psychosis. Veling et al. (2007) identified a link between migrant status and psychosis, in particular for people immigrating from developing countries. However, they found that it was not necessarily due to the social factors of adjusting to another culture that created a vulnerability to psychosis; rather it was associated with the level of discrimination experienced in the host country. With respect to psychosis a prospective population study by Janssen et al. (2003) demonstrated that a chronic experience of discrimination may eventually lead to a paranoid attributional style and consequently increase the likelihood of psychotic-like experiences. They identified age, sex, appearance, sexual orientation and disabilities as significant discriminating factors associated with risk of paranoid delusions (Janssen, Hanssen, 2003). Additional studies have demonstrated significant associations between perceived discrimination and psychosis in ethnic minority and immigrant groups, with the incidence of psychosis being higher when groups perceive more discrimination (Karlsen et al., 2005; Veling et al., 2007). Furthermore, incidence rates of psychosis have been shown to be equal among first and second-generation immigrants, indicating that post immigration stressors are equally as important as pre-migration (Morgan and Hutchinson, 2009; Seeman, 2011).

Perceived ethnic discrimination encompasses the subjective experience of differential treatment based on appearance, language, religious or socio-cultural characteristics (Brondolo et al. , 2005; Westhoff, 1993). As it emphasises appraisal, perceived ethnic discrimination is not limited to “objective” discriminatory

occurrences but may also include more subtle experiences that outside observers might not identify as discrimination (Clark et al., 1999). Perceived ethnic discrimination has been found to be associated with a number of negative health outcomes for ethnic minorities and immigrant groups (Pascoe and Smart Richman, 2009). In a review of more than 47 studies, Williams and Mohammed (2009) found that increased levels of perceived racial discrimination were associated with poorer mental health outcomes. In terms of risk, perceived racial discrimination is associated with increased risk for any mental disorder (Berger and Sarnyai, 2015; Moomal et al. , 2009). In recent years, the focus of research has shifted to the understanding of mechanisms of the relationship between perceived ethnic discrimination and psychological functioning. A recent study has suggested perceived discrimination is indirectly linked to psychiatric disorders via transdiagnostic factors (Rodriguez-Seijas et al. , 2015). In particular, the concepts of social defeat (Selten and Cantor-Graae, 2005) and stress-vulnerability (Lataster et al. , 2013; Myin-Germeys et al. , 2005) highlight how individual difference variables may influence how people perceive, respond to, and are affected by discrimination.

Individuals presenting with sub-threshold clinical features, such as attenuated or brief intermittent psychotic symptoms, or a significant decline in global functioning in the presence of genetic risk factors, are clinically grouped under the term 'ultra-high risk (UHR)', although other terms such as 'clinical high risk (CHR)' or 'at-risk mental states (ARMS)' are also used interchangeably (Fusar-Poli et al. , 2013; Yung et al. , 2003). Although the experience of different types of adversity in general can be a strong predictor of the development of psychosis, perceived ethnic

discrimination is one type of adversity in particular that has not attracted a great deal of attention in the UHR group. To the best of our knowledge there is no published research examining the complex relationship between perceived ethnic discrimination and paranoid ideation, especially in individuals with UHR. This study seeks to assess these factors in a sample of individuals with UHR, compared to healthy control participants using a virtual reality paradigm to objectively measure paranoia. Paranoid or persecutory ideation is a core symptom of psychosis and the most common type of delusional belief recorded by individuals with psychosis (Garety et al., 1988) and it has been defined as “the unfounded fear that others intend to cause you [psychological, physical or social] harm” (Freeman and Garety 2000; Freeman et al., 2008). Paranoid ideation is also prevalent in 10-15% of the general population (Freeman 2007), and can present as mild social evaluative concerns (i.e. interpersonal worries and anxieties) and mild ideas of social reference (i.e. people are laughing at me) all the way through to paranoid and delusional beliefs (i.e. the “paranoia hierarchy” (Freeman et al., 2005)). We hypothesised that compared to controls, the UHR group will report higher levels of perceived ethnic discrimination and a positive correlation between higher levels of perceived ethnic discrimination and persecutory paranoid ideation measured via a virtual reality paradigm will be present in the whole sample and in the UHR group. Finally, we tested the hypothesis that the level of perceived ethnic discrimination would predict the severity of persecutory paranoid ideation induced by the VR environment.

2. Method

2.1. Participants

Sixty-four UHR participants over 18 years old were recruited via the Outreach and Support in South London Service (OASIS), a specialist service for young people at risk of psychosis (Fusar-Poli et al., 2012). UHR participants were assessed by this service prior to participation in the research, using the Comprehensive Assessment of the At-Risk Mental State (CAARMS) assessment tool, which is based on the criteria developed by Yung and colleagues (1998) to operationally define a set of clinical features that precede a first psychotic episode (Phillips et al., 2000; Yung et al., 2003). Previous studies indicate that around 36 per cent of these individuals deemed to be at risk using the above criteria would develop psychosis within three years (Cannon et al., 2008; Fusar-Poli et al., 2012; Yung et al., 2003). Forty-three controls matched for demographic factors were recruited by advertisements in the local press and lived in the same area as the patients and self-reported no family or personal history of psychotic disorders. The Prodromal Questionnaire (PQ) (Loewy et al., 2005) was completed by all participants and used to screen healthy controls for possible prodromal symptoms.

An a priori power calculation was conducted to determine sample size. Based on previous studies reporting correlations between paranoia and perceived racism (0.4; Coombs et al., 2006) and positive symptoms and discrimination (0.2; Berg et al., 2011), we expected a small-medium effect size (Cohen, 1992). Therefore, a total sample size of 107 was sufficient for >80% power ($p < 0.05$) to detect small to medium effects.

2.2. Virtual reality paradigm

The Virtual Reality (VR) environment (developed by the Department of Computer Science at University College London) used in this study to assess paranoid ideation was identical to that used in previous research (Fornells-Ambrojo et al. , 2008; Freeman, 2008; Valmaggia et al. , 2007). The environment was designed to be perceived neutral by the majority of the general population and was a tube train ride modelled on the interior of a London Underground train carriage. It was displayed in colour via a lightweight headset; the display used was a Virtual Research VR 1280 (Virtual Research Systems, Aptos, California), with a resolution of 1280x1024 pixels, 60° diagonal field of view and a refresh rate of 60 Hz. Participants entered the train and were asked to remain on the train during the first stop, then disembark at the second stop. The journey time was approximately four minutes. Background noises were played using a Creative sound card, mimicking noises associated with a London Underground train ride (e.g., a ‘mind the closing doors’ announcement when the doors were closing, fragments of passenger conversation, background noise of the moving train). Participants wore a headset and could move through the virtual environment by walking and whole body turning.

2.3. Measures

2.3.1. The State Social Paranoia Scale (SSPS, Freeman et al., 2007)

The SSPS, a 20-item self-report assessment measure of persecutory ideation, was used to assess thoughts about the virtual reality avatars. Each item is scored on a 5-point scale (Do not agree – Totally agree) and higher scores indicate greater levels of persecutory thinking. The scale has three sub-scales: virtual reality–persecution

(10 items), virtual-reality neutral (5 items) and virtual-reality positive (5 items).

Only the persecution subscale items were used in the current study (e.g. 'Someone had it in for me', 'Someone stared at me in order to upset me', 'Someone was trying to isolate me', 'Someone was trying to make me distressed'). The VR-persecution subscale has been shown to have good convergent validity ($r=0.55$; $p=0.002$) and reliability (Cronbach's alpha =0.66) (Freeman et al., 2005). Reliability in the current UHR sample was excellent (Cronbach's alpha = 0.96).

2.3.2. Prodromal Questionnaire (PQ, Loewy et al., 2005)

The PQ was used to assess prodromal or psychotic symptoms, and is a 92-item self-report screening measure developed for people at high clinical risk for psychosis. The PQ comprises four symptom subscales: 1) Positive symptoms (e.g. unusual thinking, perceptual abnormalities and cognitive disorganisation) (45 items), 2) Negative symptoms (e.g. flat affect and social isolation) (19 items), 3) Disorganized symptoms (e.g. odd behaviour) (13 items) and 4) General symptoms (e.g. depression and role functioning) (15 items). Three PQ items specifically address the presence of paranoid ideation and suspiciousness (PQ25: 'I often feel that other people have it in for me' ; PQ68: 'I often pick up hidden threats or put-downs from what people say or do' ; PQ77: 'I'm often concerned that my closest friends,

classmates or co-workers are not really loyal or trustworthy'). Consistent with previous research (Masillo et al. , 2012), the sum of these three items (range 0-3) was used to characterise paranoid ideation/suspiciousness, and was used for the purpose of all subsequent statistical analysis.

2.3.3. Perceived Ethnic Discrimination Questionnaire- Community Version (PEDQ-CV) (Contrada et al., 2001)

The PEDQ-CV is a 70-item questionnaire assessing lifetime experiences of ethnic discrimination. It has five subscales (Lifetime Exposure to Discrimination, Discrimination in the Media, Discrimination Against Family Members, Discrimination in Different Settings, and Past Week Discrimination). The first 34 items comprise the Lifetime Exposure Discrimination scale. These items begin with the statement "Because of my ethnicity . . ." and are followed by an item describing exposure to some form of mistreatment or difficulty (e.g., "a clerk or waiter ignored me"). This 34-item subscale was used for the purpose of statistical analysis. Participants were asked to indicate how often they had ever "had these experiences during their lifetime," and each item was rated on 5-point Likert scale ranging from 1 (never happened) to 5 (happened very often).

The PEDQ-CV has good reliability (Cronbach's alpha > 0.87) (Brondolo et al., 2005, Kwok et al., 2011). There is also evidence of construct validity, with those

reporting higher levels of exposure to discrimination also indicating that they felt more threatened ($r = .43$, $p < 0.0001$) and harmed ($r = .46$, $p < 0.0001$) by these experiences (Brondolo et al., 2005). Reliability of the PEDQ-CV in the current sample was excellent (Cronbach's alpha = 0.97).

2.4. Statistical analysis

All statistical analyses were performed using the Statistical Package for Social Sciences version 21.0 (SPSS Inc., Chicago, USA; www.spss.com). Boxplots were used to determine departures from normality. Differences between groups were analysed using independent t-tests and Chi square tests as appropriate. Separate variance estimates were used when homogeneity of variance assumptions were not met. Bi-variate Pearson's correlations were carried out to explore the relationship between persecutory paranoid ideation in VR and PEDQ. Ordinal Logistic Regression (LOGIT) was used to explore baseline predictors (PEDQ and PQ-paranoia) of paranoid ideation in the VR environment. Based on the dataset, responses were grouped into four ordinal categories (corresponding to scores <10 ; 11–15; 16–25; >26) (Valmaggia et al., 2015).

3. Results

3.1. Participant characteristics

Table 1: Demographic characteristics of participants

Table 1 shows the demographic characteristics of the sample. 64 UHR and 43 healthy controls took part in the study. There were no gender, age, migration status or ethnic differences between the two groups.

3.2. Comparisons between the UHR group and healthy controls

Table 2. Group comparisons between UHR and healthy controls.

Table 2 shows group comparisons on the main study variables – paranoia in VR, perceived ethnic discrimination and paranoid prodromal symptomatology. Unsurprisingly, persecutory paranoid ideation in VR, as measured by the SSPS Persecution score, was significantly higher in the UHR group than in the HC group. Paranoid prodromal symptomatology and perceived ethnic discrimination were both also significantly higher in the UHR group compared to HC.

3.3. Relationship between perceived ethnic discrimination and paranoid ideation

There was a significant positive correlation between PEDQ and persecutory paranoia in VR in the entire sample ($r_{(104)} = 0.25, p=0.009$), that is higher levels of perceived ethnic discrimination were associated with greater paranoid persecutory ideation in VR. PEDQ and paranoid persecutory ideation in VR were not correlated in individuals at UHR ($r_{(62)} = 0.119, p=0.36$) or in HCs ($r_{(42)} = 0.212, p=0.18$).

3.4. Relationship between perceived ethnic discrimination and paranoid paranoid prodromal symptomatology

There was a significant positive correlation between PEDQ and PQ-paranoia in the entire sample ($r_{(103)} = 0.42$, $p > 0.001$), and in the UHR group ($r_{(61)} = 0.33$, $p = 0.009$). PEDQ and PQ-paranoia were not correlated in HCs ($r_{(42)} = 0.09$, $p = 0.56$).

3.5. Predictors of paranoid ideation in VR

PEDQ and PQ-paranoia were entered together in the logistic regression analysis, with paranoid ideation in VR as the dependent variable. PEDQ was not a significant predictor of paranoid ideation in VR in the total sample with an odds ratio of 0.009 (95% CI, -0.006 to 0.03; Wald $\chi^2(1) = 1.33$; $p = 0.25$) or in the UHR group (odds ratio of 0.001; 95% CI, -0.02 to 0.02; Wald $\chi^2(1) = 0.004$; $p = 0.95$).

Persecutory paranoid ideation in VR was predicted by scores on the PQ-paranoia in the whole sample with an odds ratio of 0.66 (95% CI, 0.31 to 1.00; Wald $\chi^2(1) = 14.10$; $p < 0.001$) and the UHR group (odds ratio of 0.63; 95% CI, 0.22 to 1.04; Wald $\chi^2(1) = 9.2$; $p = 0.002$). In HCs, PEDQ was found to be predictive of paranoid

ideation in VR (odds ratio of 0.046; 95% CI, 0.000 to 0.092; Wald $\chi^2(1) = 3.866$; $p = 0.049$).

4. Discussion

Our study found higher levels of perceived ethnic discrimination in individuals with UHR compared to healthy controls. Perceived ethnic discrimination and paranoid ideation in VR were correlated across the entire sample. The higher rates of exposure to perceived ethnic discrimination in the UHR group are broadly consistent with studies reporting increased prevalence rates of discriminatory experiences in people with psychosis (Corker et al., 2014; Farrelly et al., 2014; Morgan and Fisher, 2007; Saleem et al., 2014; Veling, 2013; Veling et al., 2008), as well as studies showing associations between adversity and psychotic symptoms or disorder in general population samples (Bebbington et al., 2004; Janssen et al., 2004; Spauwen et al., 2006; Whitfield et al., 2005; Wicks et al., 2005).

Our study did not find a relationship between perceived ethnic discrimination and persecutory paranoid ideation specifically in individuals at UHR of psychosis, nor did it find that perceived ethnic discrimination was a predictor of persecutory paranoid ideation in VR. However, we did observe that perceived ethnic discrimination predicted persecutory paranoid ideation in VR amongst HCs, which suggests that perceived ethnic discrimination does indeed play a role in the development of persecutory paranoia independent of positive prodromal symptomatology. Although perceived ethnic discrimination was not predictive of persecutory paranoia in VR amongst the UHR group, the findings in the HCs highlights the relationship between perceived ethnic discriminatory adversity and the

development of attenuated psychosis symptoms such as paranoia, thus illustrating the importance of understanding the effects of discriminatory experiences and their complex causal mechanisms on positive symptoms of psychosis. There are a breadth of environmental and psychosocial stressors that influence the development of psychosis and perceived discrimination, such as age, sex, appearance, sexual orientation, or handicap, which have been shown to similarly increase delusional ideation (Janssen et al., 2003), therefore perceived discrimination in general might increase vulnerability to positive symptoms such as paranoid ideation.

These findings might indirectly lend support to recent evidence by suggesting that the link between perceived discrimination and elevated rates of mental disorder can be explained by transdiagnostic factors related to higher perceived levels of discrimination (Rodriguez-Seijas et al., 2015), and the cumulative effect of stressful life experiences may play a role in the expression of positive symptoms consistent with the stress-sensitization model (Myin-Germeys and van Os, 2007; van Winkel et al., 2008). It is suggested that perceived ethnic discrimination increases general vulnerability to transdiagnostic factors such as 'worry' and 'anxiety', which might indirectly contribute to the development of attenuated psychotic symptoms. Therefore, the combination of attenuated symptoms with the presence of other biopsychosocial stressors, such as genetic predisposition, adverse life events, emotional dysregulation, substance misuse and cognitive deficits, could contribute to the development of paranoid ideation, which can be captured experimentally via VR. Future work could investigate any cumulative effect of other forms of discrimination and adversity and the tendency for paranoid ideation in the VR environment, as well as the relation between adverse experiences and neurobiological abnormalities in the

emergence of psychotic symptoms. Future research exploring how transdiagnostic factors and co-morbid symptoms mediate the relationship between discrimination/adversity and paranoid ideation in individuals at UHR using the VR environment will help to understand the aetiology and onset of persecutory paranoid ideation in a neutral environment. In addition, VR has great potential as a therapeutic tool to enable individuals to test out their fears and challenge their thought processes in a safe environment.

The elevated rates of exposure to perceived ethnic discrimination in the present UHR sample supports current cognitive models, which propose that adverse psychosocial experiences contribute to the development of a cognitive vulnerability to psychosis and lead to negative schematic beliefs about self and others (Garety et al., 2001). The findings are also consistent with recent evidence demonstrating links between negative schemas with both higher levels of perceived discrimination (Saleem et al., 2014), and prodromal symptoms (Morrison et al., 2006) in UHR groups. Future research might usefully investigate the possible psychological and social processes associated with discriminatory experiences, and how these contribute to the development of psychosis vulnerability. The question of how perceived discrimination might relate to the development of negative schematic beliefs and the cognitive biases associated with the tendency to appraise anomalous experiences using a paranoid attributional style is of particular interest.

Acknowledging that psychosocial factors such as perceived ethnic discrimination result in hostile attributions regarding the intentions of other people and increased awareness of potentially threatening behaviour in others, which could render individuals more prone to suspiciousness and paranoia (Bentall et al., 2001),

is important to shape mental health research and services. This understanding should have a long-term impact on preventative and early intervention services, emphasising life experiences and subjective meaning of symptoms. Addressing perceived ethnic discrimination and psychosocial stressors as part of a therapeutic intervention might be a useful step in alleviating distress associated with perceived threat and paranoid ideation in order to prevent transitions to the illness stage. In comparison to antipsychotic medication, psychosocial interventions offer the advantage of being more acceptable and less stigmatising, not exposing potentially false-positive UHR individuals to side-effects, as well as providing effective treatment even to false-positives (McGorry et al., 2009).

Our results should be interpreted in view of the limitations of the study. The cross-sectional nature of the design inevitably limits the inferences that can be drawn regarding causation. It therefore remains possible that some experiences of perceived ethnic discrimination may have been a consequence (as well as a potential cause) of attenuated psychotic symptoms, such as persecutory paranoia or other transdiagnostic factors. Therefore, longitudinal studies that can more robustly delineate the temporal sequence of exposure and outcome are required. Furthermore, our study demonstrated that perceived ethnic discrimination is not a significant predictor of persecutory paranoid ideation in VR in individuals at UHR of psychosis and that PQ does predict persecutory paranoia in VR. This might be due to PQ and perceived ethnic discrimination being positively correlated in this study, therefore, larger samples will be required to tease out the influence of perceived ethnic discrimination on persecutory paranoia in VR. This perhaps highlights a key issue in defining the distinguishing characteristics of persecutory paranoid ideation in the

UHR group, which is heterogeneous in nature, and is likely to include a mix of those with true prodromal schizophrenia, affective psychosis and other psychiatric disorders, individuals who are on the psychotic spectrum but have a favourable outcome, and the majority of individuals who will never develop the illness.

Furthermore, it is possible that perceived ethnic discrimination might be more prevalent in ethnic minority groups and studies have shown that incidence of schizophrenia and other psychotic disorders are higher in these populations (Fearon et al., 2006), however, context-specific stressful environmental factors influence specific symptom patterns and severity (Berg et al., 2011). In the UK, the risk for developing psychosis in African-Caribbean's is much higher than for South Asians (Fearon et al., 2006) who are likely to experience a higher degree of discrimination (Karlsen et al., 2005). Ethnic minority groups are known to differ in terms of their stigmatised status in society. The current study includes a sample from South London which has a high percentage of African-Caribbean's ("Southwark JSNA Executive Summary, 2011") and thus their non-minority status within the specific region might have contributed to their overall perception of discrimination. Other geographical regions might be more likely to have higher rates of perceived discrimination amongst ethnic minorities.

Additionally, a number of factors affect the generalizability of the findings. For example, a convenience sampling method was used, which consisted of individuals at risk who were help-seeking, and may therefore not be representative of all people in the general population who are at risk. It is also plausible that

individuals with very high levels of perceived ethnic discrimination might be resistant to seeking help as they are more likely to be worried about stigma and further discriminatory experiences. Finally, we did not consider the potential confounding impact of co-morbid diagnoses, which are often found in people at high risk of developing psychosis (Haroun et al., 2006; Yung et al., 2004), and perceived discrimination has been linked particularly to depression and anxiety (Ikram et al., 2015; Kessler et al., 1999; Miranda et al., 2013). Future research might also usefully examine the specificity of the effect by employing a clinical control group and controlling for any effects of co-morbid diagnoses.

Conclusions

We found that perceived ethnic discrimination was higher in individuals in the UHR group compared with HCs. Perceived ethnic discrimination also appeared to play a role in the development of persecutory paranoid ideation observed in VR across the whole sample and in HCs. These findings highlight the potential utility of exploring how an individual's perception of adverse experience might relate to how they develop attenuated psychotic features and respond to current perceived threat and paranoid ideation.

Acknowledgements

Our special thanks go to the staff and service users of OASIS. We also acknowledge Prof Daniel Freeman, Dr Angus Antley and Prof Mel Slater for their advice and support with the Virtual Reality Lab.

Conflict of Interest

None.

Funding:

NARSAD Young Investigator Award from the Brain and Behaviour Research Foundation, and Peggy Pollack Research Fellowship from the Psychiatry Research Trust. Both awarded to Dr Valmaggia. Philip McGuire was supported by a grant from the Medical Research Council (grant number G0700995). The authors acknowledge financial support from the National Institute for Health Research (NIHR) Biomedical Research Centre for Mental Health at South London and Maudsley NHS Foundation Trust and King's College London. The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health.

References

- Bebbington, P.E., Bhugra, D., Brugha, T., Singleton, N., Farrell, M., Jenkins, R., et al., 2004. Psychosis, victimisation and childhood disadvantage: evidence from the second British National Survey of Psychiatric Morbidity. *Br. J. Psychiatry.* 185, 220-226.
- Bentall, R.P., Corcoran, R., Howard, R., Blackwood, N., Kinderman, P., 2001. Persecutory delusions: a review and theoretical integration. *Clin. Psychol. Rev.* 21,1143-1192.
- Berg, A.O., Melle, I., Rossberg, J.I., Romm, K.L., Larsson, S., Lagerberg, T.V., et al., 2011. Perceived discrimination is associated with severity of positive and depression/anxiety symptoms in immigrants with psychosis: a cross-sectional study. *BMC Psychiatry.* 11, 77.
- Berger, M., Sarnyai, Z., 2015. "More than skin deep": stress neurobiology and mental health consequences of racial discrimination. *Stress.* 18, 1-10.
- Brondolo, E., Kelly, K.P., Coakley, V., Gordon, T., Thompson, S., Levy, E., et al., 2005. The Perceived Ethnic Discrimination Questionnaire: Development and preliminary validation of a community version. *Journal of Applied Social Psychology.* 35, 335-365.
- Cannon, T.D., Cadenhead, K., Cornblatt, B., Woods, S.W., Addington, J., Walker, E., et al., 2008. Prediction of psychosis in youth at high clinical risk: a multisite longitudinal study in North America. *Arch. Gen. Psychiatry.* 65, 28-37.
- Clark, R., Anderson, N.B., Clark, V.R., Williams, D.R., 1999. Racism as a stressor for African Americans. A biopsychosocial model. *Am. Psychol.* 54, 805-816.
- Contrada, R.J., Ashmore, R.D., Gary, M.L., Coups, E., Egeth, J.D., Sewell, A., et al., 2001. Measures of ethnicity-related stress: Psychometric properties, ethnic group differences, and associations with well-being. *Journal of Applied Social Psychology.* 31, 1775-1820.
- Corker, E.A., Beldie, A., Brain, C., Jakovljevic, M., Jarema, M., Karamustafalioglu, O., et al., 2014. Experience of stigma and discrimination reported by people experiencing the first episode of schizophrenia and those with a first episode of depression: The FEDORA project. *Int. J. Soc. Psychiatry.*
- Farrelly, S., Clement, S., Gabbidon, J., Jeffery, D., Dockery, L., Lassman, F., et al., 2014. Anticipated and experienced discrimination amongst people with schizophrenia, bipolar disorder and major depressive disorder: a cross sectional study. *BMC Psychiatry.* 14, 157.
- Fearon, P., Kirkbride, J.B., Morgan, C., Dazzan, P., Morgan, K., Lloyd, T., et al., 2006. Incidence of schizophrenia and other psychoses in ethnic minority groups: results from the MRC AESOP Study. *Psychol. Med.* 36(11), 1541-1550.

Fornells-Ambrojo, M., Barker, C., Swapp, D., Slater, M., Antley, A., Freeman, D., 2008. Virtual reality and persecutory delusions: safety and feasibility. *Schizophr. Res.* 104, 228-236.

Freeman, D., 2008. Studying and treating schizophrenia using virtual reality: a new paradigm. *Schizophr. Bull.* 34, 605-610.

Freeman, D., Pugh, K., Antley, A., Slater, M., Bebbington, P., Gittins, M., et al., 2008. Virtual reality study of paranoid thinking in the general population. *Br. J. Psychiatry.* 192, 258-263.

Freeman, D., 2007. Suspicious minds: the psychology of persecutory delusions. *Clin. Psychol. Rev.* 27, 425-457.

Freeman, D., Garety, P.A., Bebbington, P., Slater, M., Kuipers, E., Fowler, D., et al., 2005. The psychology of persecutory ideation II: a virtual reality experimental study. *J. Nerv. Ment. Dis.* 193, 309-315.

Freeman, D., Garety, P.A., Bebbington, P.E., Smith, B., Rollinson, R., Fowler, D., et al., 2005. Psychological investigation of the structure of paranoia in a non-clinical population. *Br. J. Psychiatry.* 186, 427-435.

Freeman, D., Garety, P.A., 2000. Comments on the content of persecutory delusions: does the definition need clarification? *Br. J. Clin. Psychol.* 39 (Pt 4), 407-414.

Fusar-Poli, P., Borgwardt, S., Bechdolf, A., Addington, J., Riecher-Rossler, A., Schultze-Lutter, F., et al., 2013. The psychosis high-risk state: a comprehensive state-of-the-art review. *JAMA psychiatry.* 70, 107-120.

Fusar-Poli, P., Byrne, M., Badger, S., Valmaggia, L.R., McGuire, P.K., 2012. Outreach and support in South London (OASIS), 2001-2011: Ten years of early diagnosis and treatment for young individuals at high clinical risk for psychosis. *European psychiatry : the journal of the Association of European Psychiatrists.*

Garety, P.A., Kuipers, E., Fowler, D., Freeman, D., Bebbington, P.E., 2001. A cognitive model of the positive symptoms of psychosis. *Psychol. Med.* 31, 189-195.

Garety, P., Everitt, A.B.S., Hemsley, D.R., 1988. The characteristics of delusions: a cluster analysis of deluded subjects. *Eur. Arch. Psychiatry. Neurol. Sci.* 237, 112-114.

Haroun, N., Dunn, L., Haroun, A., Cadenhead, K.S., 2006. Risk and protection in prodromal schizophrenia: ethical implications for clinical practice and future research. *Schizophr. Bull.* 32, 166-178.

- Ikram, U.Z., Snijder, M.B., Fassaert, T.J., Schene, A.H., Kunst, A.E., Stronks, K., 2015. The contribution of perceived ethnic discrimination to the prevalence of depression. *Eur. J. Public. Health.* 25, 243-248.
- Janssen, I., Hanssen, M., Bak, M., Bijl, R.V., de Graaf, R., Vollebergh, W., et al., 2003. Discrimination and delusional ideation. *Br. J. Psychiatry.* 182, 71-76.
- Janssen, I., Krabbendam, L., Bak, M., Hanssen, M., Vollebergh, W., de Graaf, R., et al., 2004. Childhood abuse as a risk factor for psychotic experiences. *Acta. Psychiatr. Scand.* 109, 38-45.
- Karlsen, S., Nazroo, J.Y., McKenzie, K., Bhui, K., Weich, S., 2005. Racism, psychosis and common mental disorder among ethnic minority groups in England. *Psychol. Med.* 35, 1795-1803.
- Kessler, R.C, Mickelson, K.D., Williams, D.R., 1999. The prevalence, distribution, and mental health correlates of perceived discrimination in the United States. *J. Health. Soc. Behav.* 40, 208-230.
- Kwok, J., Atencio, J., Ullah, J., Crupi, R., Chen, D., Roth, A.R., et al., 2011. The perceived ethnic discrimination questionnaire--community version: validation in a multiethnic Asian sample. *Cultural Diversity and Ethnic Minority Psychology.* 17, 271-282.
- Lataster, T., Valmaggia, L., Lardinois, M., van Os, J., Myin-Germeys, I., 2013. Increased stress reactivity: a mechanism specifically associated with the positive symptoms of psychotic disorder. *Psychol. Med.* 43, 1389-1400.
- Loewy, R.L., Bearden, C.E., Johnson, J.K., Raine, A., Cannon, T.D., 2005. The prodromal questionnaire (PQ): preliminary validation of a self-report screening measure for prodromal and psychotic syndromes. *Schizophr. Res.* 77, 141-149.
- Masillo, A., Day, F., Laing, J., Howes, O., Fusar-Poli, P., Byrne, M., et al., 2012. Interpersonal sensitivity in the at-risk mental state for psychosis. *Psychol. Med.* 42, 1835-1845.
- McGorry, P.D., Nelson, B., Amminger, G.P., Bechdolf, A., Francey, S.M., Berger, G., et al., 2009. Intervention in individuals at ultra-high risk for psychosis: a review and future directions. *J. Clin. Psychiatry.* 70, 1206-1212.
- Miranda, R., Polanco-Roman, L., Tsydes, A., Valderrama, J., 2013. Perceived discrimination, ruminative subtypes, and risk for depressive symptoms in emerging adulthood. *Cultur. Divers. Ethnic. Minor. Psychol.* 19, 395-403.
- Moomal, H., Jackson, P.B., Stein, D.J., Herman, A., Myer, L., Seedat, S., et al., 2009. Perceived discrimination and mental health disorders: the South African Stress and Health study. *S. Afr. Med. J.* 99, 383-389.
- Morgan, C., Fisher, H., 2007. Environment and schizophrenia: environmental factors in schizophrenia: childhood trauma--a critical review. *Schizophr. Bull.* 33, 3-10.

- Morgan, C., Hutchinson, G., 2009. The social determinants of psychosis in migrant and ethnic minority populations: a public health tragedy. *Psychol. Med.* 1-5.
- Morrison, A.P., French, P., Lewis, S.W., Roberts, M., Raja, S., Neil, S.T., et al., 2006. Psychological factors in people at ultra-high risk of psychosis: comparisons with non-patients and associations with symptoms. *Psychol. Med.* 36, 1395-1404.
- Myin-Germeys, I., Delespaul, P., van Os, J., 2005. Behavioural sensitization to daily life stress in psychosis. *Psychol. Med.* 35, 733-741.
- Myin-Germeys, I., van Os, J., 2007. Stress-reactivity in psychosis: evidence for an affective pathway to psychosis. *Clinical Psychology Review.* 27(4), 409- 424.
- Pascoe, E.A., Smart Richman, L., 2009. Perceived discrimination and health: a meta-analytic review. *Psychol. Bull.* 135, 531-554.
- Phillips, L.J., Yung, A.R., McGorry, P.D., 2000. Identification of young people at risk of psychosis: validation of Personal Assessment and Crisis Evaluation Clinic intake criteria. *Aust. N. Z. J. Psychiatry.* 34 Suppl, 164-169.
- Rodriguez-Seijas, C., Stohl, M., Hasin, D.S., Eaton, N.R., 2015. Transdiagnostic Factors and Mediation of the Relationship Between Perceived Racial Discrimination and Mental Disorders. *JAMA Psychiatry.* 72, 706-713.
- Saleem, M.M., Stowkowy, J., Cadenhead, K.S., Cannon, T.D., Cornblatt, B.A., McGlashan, T.H., et al., 2014. Perceived discrimination in those at clinical high risk for psychosis. *Early. Interv. Psychiatry.* 8, 77-81.
- Seeman, M.V., 2011. Canada: psychosis in the immigrant Caribbean population. *Int. J. Soc. Psychiatry.* 57, 462-470.
- Selten, J.P., Cantor-Graae, E., 2005. Social defeat: risk factor for schizophrenia? *Br. J. Psychiatry.* 187, 101-102.
- Spauwen, J., Krabbendam, L., Lieb, R., Wittchen, H.U., van Os, J., 2006. Impact of psychological trauma on the development of psychotic symptoms: relationship with psychosis proneness. *Br. J. Psychiatry.* 188, 527-533.
- Valmaggia, L.R., Day, F., Garety, P., Freeman, D., Antley, A., Slater, M., et al., 2015. Social defeat predicts paranoid appraisals in people at high risk for psychosis. *Schizophr. Res.*
- Valmaggia, L.R., Freeman, D., Green, C., Garety, P., Swapp, D., Antley, A., et al., 2007. Virtual reality and paranoid ideations in people with an 'at-risk mental state' for psychosis. *Br. J. Psychiatry. Suppl.* 51, 63-68.
- van Winkel, R., Stefanis, N.C., Myin-Germeys, I., 2008. Psychosocial stress and psychosis. A review of the neurobiological mechanisms and the evidence for gene-stress interaction. *Schizophrenia Bulletin.* 34(6), 1095-1105.

Velting, W., 2013. Ethnic minority position and risk for psychotic disorders. *Curr. Opin. Psychiatry*. 26, 166-171.

Velting, W., Hoek, H.W., Mackenbach, J.P., 2008. Perceived discrimination and the risk of schizophrenia in ethnic minorities: a case-control study. *Soc. Psychiatry. Psychiatr. Epidemiol.* 43, 953-959.

Velting, W., Selten, J.P., Susser, E., Laan, W., Mackenbach, J.P., Hoek, H.W., 2007. Discrimination and the incidence of psychotic disorders among ethnic minorities in The Netherlands. *Int. J. Epidemiol.* 36, 761-768.

Westhoff, W., 1993. A psychosocial study of albinism in a predominantly Mulatto Caribbean community. *Psychol. Rep.* 73, 1007-1010.

Whitfield, C.L., Dube, S.R., Felitti, V.J., Anda, R.F., 2005. Adverse childhood experiences and hallucinations. *Child. Abuse. Negl.* 29, 797-810.

Wicks, S., Hjern, A., Gunnell, D., Lewis, G., Dalman, C., 2005. Social adversity in childhood and the risk of developing psychosis: a national cohort study. *Am. J. Psychiatry.* 162, 1652-1657.

Williams, D.R., Mohammed, S.A., 2009. Discrimination and racial disparities in health: evidence and needed research. *J. Behav. Med.* 32, 20-47.

Yung, A.R., Phillips, L.J., McGorry, P.D., McFarlane, C.A., Francey, S., Harrigan, S., et al., 1998. Prediction of psychosis. A step towards indicated prevention of schizophrenia. *Br. J. Psychiatry. Suppl.* 172, 14-20.

Yung, A.R., Phillips, L.J., Yuen, H.P., Francey, S.M., McFarlane, C.A., Hallgren, M., et al., 2003. Psychosis prediction: 12-month follow up of a high-risk ("prodromal") group. *Schizophr. Res.* 60, 21-32.

Yung, A.R., Phillips, L.J., Yuen, H.P., McGorry, P.D., 2004. Risk factors for psychosis in an ultra high-risk group: psychopathology and clinical features. *Schizophr. Res.* 67, 131-142.

Table 1: Demographic characteristics of participants

		UHR	Controls	Statistic
N		64	43	
Female		26	23	$X^2_{(1)}=1.71$, $p=0.19$

Age, Mean (SD)		22.55 (+/-4.01)	24.02 (+/-4.07)	$F_{(105)}=0.23$, $p=0.07$
Ethnicity	Black	19 (30%)	10 (23%)	$\chi^2_{(3)}=0.90$, $p=0.83$
	White British	23 (36%)	16 (37%)	
	White Other	11 (17%)	7 (16%)	
	Other	11 (17%)	10 (23%)	
Migration status	Non-migrant	41	22	$\chi^2_{(2)}=5.23$, $p=0.07$
	1 st generation immigrant	9	14	
	2 nd generation immigrant	14	7	

Table 2. Group comparisons between UHR and healthy controls.

	UHR	Controls	Statistic
--	-----	----------	-----------

PQ-paranoia	1.55 (+/- 1.28)	0.30 (+/- 0.6)	$t_{(103)}=-5.96, p<0.001$
PEDQ	63.77 (+/- 29.89)	45.86(+/- 13.87)	$t_{(102)}=-3.63, p<0.001$
Paranoid Ideation in VR (SSPS)	20.33 (+/- 11.01)	11.69 (+/- 2.93)	$t_{(104)}=-4.96, p<0.001$

Highlights

- Using Virtual Reality, we examined the relationship between perceived ethnic discrimination and paranoia in UHR
- Perceived ethnic discrimination was higher in UHR group compared to controls.
- Perceived ethnic discrimination and paranoid persecutory ideation were positively correlated.
- Psychosocial adversity contributes to development of attenuated positive symptoms.