Suicide Risk, Stress Sensitivity, and Self-Esteem among Young Adults Reporting Auditory Hallucinations

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Individuals with subthreshold psychotic experiences are at increased risk for suicidal thoughts and behavior, similar to those with schizophrenia and other psychotic disorders. This may be explained by shared risk factors such as heightened stress sensitivity or low self-esteem. Understanding the nature of this relationship could inform suicide prevention in social work practice. In this study, authors examined the relationship between self-reported auditory hallucinations and suicidal thoughts, plans, and attempts, in a nonclinical sample of young adults, controlling for scores on the Psychological Stress Index and Rosenberg Self-Esteem Scale. Auditory hallucinations were associated with approximately double the odds of suicidal ideation and plans and four times the odds for suicide attempts. This relationship was not explained by stress sensitivity or self-esteem, which were independently related to hallucinations and suicidality, respectively. Subthreshold auditory hallucinations may be a useful indicator of suicide risk. This association may represent a clinically significant relationship that may be addressed through social work interventions intended to alleviate stress sensitivity or improve self-esteem.

KEY WORDS: psychosis; psychotic experience; self-esteem; stress; suicide attempts

Suicide attempts and completed suicides are highly prevalent among individuals with psychotic disorders (Harkavy-Friedman et al., 1999; Palmer, Pankratz, & Bostwick, 2005). Continuum models of psychosis posit the existence of an extended psychosis phenotype, with an estimated 7.2 percent of the general population experiencing subclinical psychotic experiences at some point in their lives, despite not meeting diagnostic criteria for a psychotic disorder (Linscott & Van Os, 2013). These subthreshold symptoms have nonetheless been associated with an increased likelihood of receiving mental health services or feeling the need for care (DeVylder, Oh, Corcoran, & Lukens, 2014; Murphy, Shevlin, Houston, & Adamson, 2012), with one recent review highlighting their broader clinical significance in terms of implications for social work practice (Oh, DeVylder, & Chen, 2014). Understanding how associations between psychosis and suicide extend to this subthreshold range can further inform clinical social work practice, as psychotic experiences may serve as useful indicators of suicide risk and as targets in suicide prevention efforts.

There is now substantial evidence that suicidal ideation and behavior are common among people with subthreshold psychotic experiences. Two recent prospective studies have demonstrated that adolescent psychotic experiences predict subsequent suicide attempts (Fisher, Caspi, et al., 2013; Kelleher et al., 2013). This is in concurrence with previous cross-sectional work showing that psychotic experiences are associated with increased odds of ideation, plans, or attempts (Kelleher et al., 2012) and self-harm behaviors (Nishida et al., 2010) in adolescents and with suicidal thoughts and behavior in adults (Saha et al., 2011). Studies examining psychotic experiences that consist predominantly of hallucination-like experiences, in particular, have shown a relationship between psychosis and greater severity of suicidal behavior (that is, attempts versus ideation) (Kelleher et al., 2012).

It is currently unclear whether the association between subthreshold hallucinations and suicide risk is causal or is due to shared underlying risk factors, such as stress sensitivity or low self-esteem. These factors not only may indicate potential confounders for the relationship between psychosis and suicidality, but also may indicate potential points for social work intervention. Prior studies have demonstrated relationships between subthreshold psychosis and both heightened stress sensitivity (Collip et al., 2011; DeVylder et al.,...
2013; Gibson et al., 2014) and low self-esteem (Fisher, Schreier, et al., 2013; Pruessner, Iyer, Faridi, Joober, & Malla, 2011), but none have examined these factors together in relation to both psychotic experiences and suicidality.

The aims of the present study were to examine the relationship between subthreshold psychotic experiences, specifically auditory hallucinations, and stress sensitivity, self-esteem, and suicidal thoughts and behavior in a large sample of young adult college students. The primary hypothesis was that auditory hallucinations would be associated with greater severity of suicidal thoughts and behavior. The secondary hypothesis was that psychotic experiences would likewise be associated with stress sensitivity and low self-esteem, which may explain the relationship between psychosis and suicide risk. Such evidence would support both (a) the use of psychosis screens as indicators of suicide risk in clinical practice and (b) the adaptation of interventions targeting stress sensitivity and self-esteem for particular use with this population.

**METHOD**

**Participants**

Data were collected as part of mass testing for introductory psychology classes at an undergraduate university during the Fall 2013 semester. Surveys were completed on computers using Qualtrics software. Students were given the option of completing the survey or writing a paper. Of 777 potential respondents, 686 (88.3 percent) elected to complete the survey. Of these, 64 were excluded because of missing data on key variables of interest, leaving a final sample size of 622. All participants provided informed electronic consent, and study protocol was approved by the Protections of Human Subjects Committee at the College of William & Mary.

**Measures**

Demographic variables, including age, sex, and race/ethnicity were self-reported by survey respondents. Descriptive data are reported for each race/ethnicity, which was then dichotomized into a variable indicating racial/ethnic minority or white to preserve statistical power. Self-identified sexual orientation was derived from a single continuous seven-point Likert scale item, anchored by exclusively heterosexual and exclusively homosexual and recoded dichotomously with a positive score indicating any response other than exclusively heterosexual.

Auditory hallucinations were assessed using a single item drawn from a recent scale assessing putative pre-psychotic states, which asks, “Do you hear some sounds, voices, or calls of your name when nobody is around you?” (Liu et al., 2013). This scale additionally included three items assessing subthreshold delusions, which were endorsed by the majority of respondents and therefore were excluded because of the low face validity of the majority of college students having psychotic experiences and the resulting high likelihood of misclassification errors. Suicidality was assessed through two categorical items developed for this survey. The first item asked, “Have you ever seriously thought about committing suicide?” with response options indicating (a) yes, and made a plan for how to do it; (b) yes, but did not make a plan; and (c) no. The second item asked, “Have you ever attempted suicide?” with response options including (a) yes, with the intention to die; (b) yes, as a cry for help, I did not intend to die; and (c) no. These two items were recoded into a single categorical variable consisting of mutually exclusive categories indicating no suicidal thoughts or behavior, suicidal ideation (in the absence of plans or attempts), suicidal plans (in the absence of attempts), and suicide attempts (including both positive responses, given the low frequency of reported attempts with intent to die in this sample; n = 3). Self-esteem was assessed using the sum of the Rosenberg Self-Esteem Scale (Rosenberg, 1965), a well-validated measure consisting of 10 self-report Likert scale items with four response options (strongly agree, agree, disagree, and strongly disagree). Internal consistency in this sample was very good to excellent (α = .89). Stress sensitivity was assessed using the nine-item Psychological Stress Index [PSI] (Tso, Grove, & Taylor, 2012), a self-report measure shown to have superior predictive validity for clinical and functional outcomes compared with other stress scales among individuals with psychosis. PSI items are rated on a five-point scale (0 = never to 4 = very often), with good internal consistency (α = .80) in this sample.

**Analyses**

All analyses were performed using SPSS Version 21.0 for Macintosh. Differences in demographic variables, self-esteem, and stress sensitivity by the presence of auditory hallucinations were tested using Student’s independent-samples t tests and chi-square tests for continuous and categorical variables, respectively. All factors that were significant at the trend level (p < .10) were entered into a logistic regression model to test for independent associations with auditory
hallucinations. Finally, these same factors were entered as covariates in a nominal regression model testing the relationship between auditory hallucinations and suicidal thoughts and behavior. All significance tests were two-tailed ($\alpha = .05$).

**RESULTS**

Auditory hallucinations were reported by 25.9 percent ($n = 161$) of respondents. As for suicidal behavior, 19.9 percent ($n = 124$) endorsed suicidal ideation (without plans or attempts), 5.5 percent ($n = 34$) endorsed suicidal plans (without attempts), and 2.7 percent ($n = 17$) endorsed attempts. Respondents with auditory hallucinations were more likely to be racial/ethnic minorities and to not be heterosexual (statistical trend), with greater sensitivity to stress and lower self-esteem (see Table 1). Auditory hallucinations were independently associated only with ethnicity and stress sensitivity in logistic regression analysis (see Table 2). Progressively greater severity of suicidal thoughts and behavior was associated with greater prevalence of auditory hallucinations [$\chi^2(3, N = 622) = 25.37, p < .001$] (see Figure 1). Suicidality was likewise associated with self-esteem [$F(3, 618) = 39.44, p < .001$] and stress sensitivity [$F(3, 618) = 8.23, p < .001$], in bivariate analyses. Auditory hallucinations were significantly associated with suicidal ideation, plans, and attempts in nominal logistic regression, adjusted for stress sensitivity, self-esteem, ethnicity, and sexuality (see Table 3). Among those with auditory hallucinations, nine of 10 suicide attempts were planned and two of 10 were made with intent to die, versus four of seven planned and one of seven with intent among those without auditory hallucinations. Low cell counts precluded further analysis of attempts by subtype.

| Table 1: Descriptive Data by Presence (AH+) or Absence (AH–) of Auditory Hallucinations, with Bivariate Statistics |
|--------------------------------------------------|--------------------------------------------------|------------------|---------|
| Variable                                          | $AH^+ (n = 161)$ | $AH– (n = 461)$ | Statistics       |
|                                                  | $n$ (%)           | $M$ (SD)        | $n$ (%)           | $M$ (SD)        | $\chi^2(1, N = 622)$                  |
| Categorical                                       |                    |                  |                    |                  |                                  |
| Female gender                                     | 93 (57.8)         | 258 (56.0)      |                    |                    | $0.16, p = .692$                     |
| Race/ethnicity*                                   | 75 (46.6)         | 154 (33.4)      |                    |                    | $8.91, p = .003$                     |
| American Indian                                   | 2 (1.2)           | 1 (0.2)         |                    |                    |                                  |
| Hawaiian/Pacific Islander                         | 1 (0.6)           | 1 (0.2)         |                    |                    |                                  |
| Asian                                             | 17 (10.6)         | 58 (12.6)       |                    |                    |                                  |
| Black/African American                            | 17 (10.6)         | 34 (7.4)        |                    |                    |                                  |
| Hispanic/Latino                                   | 16 (9.9)          | 27 (5.9)        |                    |                    |                                  |
| White                                             | 87 (53.4)         | 307 (66.6)      |                    |                    |                                  |
| Multiracial                                       | 17 (10.6)         | 26 (5.6)        |                    |                    |                                  |
| Declined to report                                | 5 (3.1)           | 7 (1.5)         |                    |                    |                                  |
| Bi sexuality/homosexuality                        | 53 (32.9)         | 118 (25.6)      |                    |                    | $3.21, p = .073$                    |
| Continuous                                        |                    |                  |                    |                    |                                  |
| Age                                               | 18.81 (1.29)      | 18.76 (1.44)    | $t(620) = 0.36, p = .716$ |
| Social desirability                               | 5.27 (1.68)       | 5.56 (2.83)     | $t(620) = −1.11, p = .267$ |
| Psychological Stress Index                        | 26.01 (5.42)      | 24.11 (5.40)    | $t(620) = 3.85, p < .001$ |
| Rosenberg Self-Esteem Scale                       | 19.76 (5.45)      | 21.05 (5.25)    | $t(620) = −2.64, p = .009$ |

*Full descriptive data are provided for race/ethnicity. However, because of statistical power limitations, all analyses use a dichotomous variable indicating white/nonwhite race/ethnicity.

| Table 2: Predictors of Auditory Hallucinations in Logistic Regression |
|--------------------------------------------------|------------------|---------|
| Variable                                          | Odds Ratio       | 95% CI  | Wald Test |
| Constant                                          | 10.96            | .001    |
| Categorical                                       |                  |        |           |
| Nonwhite                                          | 1.78             | 1.22—2.58 | 9.13     | .003    |
| Bi sexuality/homosexuality                        | 1.34             | 0.90—2.00 | 2.06     | .152    |
| Continuous                                        |                  |        |           |
| Psychological Stress Index                        | 1.06             | 1.02—1.10 | 9.31     | .002    |
| Rosenberg Self-Esteem Scale                       | 0.99             | 0.95—1.03 | 0.36     | .547    |

*Note: Odds ratios are adjusted for remaining variables in a single model. CI = confidence interval.
DISCUSSION

Main Findings

In this sample, auditory hallucinations were associated with suicidal thoughts and behavior, with a greater prevalence of auditory hallucinations associated with increasing severity of suicidal behavior. This reinforces the assertion that subthreshold psychosis may carry clinical relevance in social work practice, despite not meeting threshold cutoffs for DSM-5 (American Psychiatric Association, 2013) psychotic disorder criteria (Oh et al., 2014). The relationship between hallucinations and suicidality was not explained by stress sensitivity or self-esteem, although low self-esteem was independently associated with all levels of suicide risk. Auditory hallucinations were themselves related to stress sensitivity and self-esteem, although after controlling for confounding factors, only the relationship with stress sensitivity remained, suggesting that these may represent valuable targets for psychosocial intervention. This is consistent with prior research on stress sensitivity and self-esteem in both population-level and clinical samples of individuals with subthreshold psychotic experiences (Collip et al., 2011; DeVyllder et al., 2013; Fisher, Schreier, et al., 2013; Gibson et al., 2014; Pruessner et al., 2011).

Subclinical psychotic experiences have been linked to suicide risk in several studies of adolescents...
Demographic Associations with Psychosis and Suicidality

In our analysis of psychosis and suicidality, we controlled for a crude measure of sexual orientation, which was associated with psychotic experiences at a trend level. This is the first study, to our knowledge, to examine sexual orientation in relation to psychotic experiences. Although it was not the focus of our study, an association between nonheterosexuality and psychotic experiences would be predicted given that bisexuality and homosexuality are associated with known risk factors for psychosis, including social exclusion and discrimination (Selten & Cantor-Graae, 2007). This preliminary trend-level finding warrants further exploration in future studies, using improved measures of sexuality and analyses of potential interactions between gender and sexual orientation, which were beyond the scope of the current study. Of note, sexuality was also associated with suicidal ideation and plans but not attempts in this sample.

Racial/ethnic minority status was significantly associated with psychotic experiences, consistent with prior reports of adults in the United States (Cohen & Marino, 2013) and in the United Kingdom (Johns et al., 2004; Johns, Nazroo, Bebbington, & Kuipers, 2002; King et al., 2005; Morgan et al., 2009). It is notable that this variable was also associated with fivefold odds for suicide attempts, with adjustment for auditory hallucinations. Mental health service providers serving college students and others of this age group should be particularly aware of this elevated risk for suicide attempts. Population-level studies on racial and ethnic differences in suicide risk, however, have been inconsistent, finding reduced odds for suicide attempts among black Americans in the National Comorbidity Survey (Kessler et al., 1999) but not in the National Comorbidity Survey Replication (Kessler et al., 2005), where African Americans reporting ideation were actually at increased odds for attempts compared with others with ideation (Borges et al., 2006).

Practice Implications

Given the elevated risk for suicidal behavior associated with auditory hallucinations in this sample, screening for psychotic experiences among young adults with suicidal ideation or other risk factors may provide clinically valuable preventive information. Although the present finding is in a sample of college students, the now consistent replication of an association between subthreshold psychosis (particularly hallucinations) and suicidal behavior suggests that recognition of this relationship may inform social work practice beyond the college setting. In addition to suicide risk, subthreshold psychosis is associated with a cluster of reasons for clinical need, although there is currently minimal evidence on how to best approach this population clinically (Oh et al., 2014). Interventions that efficaciously address stress sensitivity and poor social relationships in psychotic disorders may inform the development of evidence-based intervention for individuals reporting subthreshold psychotic symptoms. These include social skills training (Kurtz & Mueser, 2008), which has previously been included in psychosis-risk treatment protocols (Bechdolf et al., 2012), and cognitive–behavioral therapy (Gregory, 2010), which has been supported as a viable intervention for subthreshold psychosis in several randomized clinical trials (Morrison et al., 2004, 2007) and even as a stand-alone treatment for unmedicated schizophrenia (Morrison et al., 2014). Modified forms of cognitive–behavioral therapy may be particularly appropriate for the co-occurrence of psychosis and suicidality (Stanley et al., 2009). At the population level, suicide is a leading cause of preventable death and is notoriously difficult to predict (Beaglehole, Irwin, & Prestice, 2003). In conjunction with prior studies on this topic, we can speculate that screening for psychotic experiences may reduce the prevalence of suicidal...
behavior in clinical settings, particularly with college students, although this is in need of research verifying the utility of this application in clinical settings.

Limitations and Conclusions
The primary potential limitation of this study was the acquisition of our sample through a nonanonymous survey of college students. The issue of anonymity likely had minimal effect given the high prevalence of auditory hallucinations and lack of an association between the hallucination measure and the social desirability scale. Samples of college students are associated with additional concerns around generalizability. However, understanding suicidality and psychosis is useful particularly in this age range, which is characterized by elevated risk for psychosis and suicidal behavior. College students also may be more representative of the general population than help-seeking samples, which have formed the bulk of research on attenuated psychosis (Gibson et al., 2014). Finally, the item indicating the presence of auditory hallucinations is from a recently validated scale. This study may have benefited from the use of a more comprehensive measure of subthreshold psychosis such as the Community Assessment of Psychic Experiences (Konnings, Bak, Hanssen, Van Os, & Krabbendam, 2006). It would also have been useful to assess for schizophrenia and other psychotic disorders to distinguish threshold-level versus subthreshold auditory hallucinations, although we can assume that the majority were of subthreshold intensity given that the prevalence of auditory hallucinations in this sample far outweighs typical prevalence estimates of psychotic disorders in community samples. The high prevalence indicates the likelihood that we captured some false positive responses, although this rate is in the range of prior research using self-report measures (Linscott & Van Os, 2013).

The link between subthreshold psychosis and suicide risk has been progressively established over recent years but has not previously been specifically observed among the high-risk age group of young adulthood. Further, it has received minimal attention from social work, the field responsible for providing the majority of mental health services in the United States. Additional research is needed on the feasibility and efficacy of screening for auditory hallucinations and other psychotic experiences in the clinical setting, in terms of their value in predicting further suicidal behavior and thus contributing toward suicide prevention. In the meantime, clinicians can use this information informally to guide assessment with college students and college-age clients reporting suicidal thoughts, among whom the endorsement of auditory hallucinations may indicate risk for further suicidal behavior, even in the absence of a diagnosable psychotic disorder.

REFERENCES

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