Risk of Psychosis among Patients with Dementia: The Roles of Loneliness, Life Satisfaction, Autonomy, Physical Health and Eyesight Loss

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Abstract

Previous studies found that 34-63% of patients with dementia suffer from psychotic symptoms, and previous theories suggest that patients with dementia are cognitively vulnerable and thus more at risk of psychosis, but few studies have explored potential psychosocial and health explanations for the dementia-psychosis link. This study aimed to investigate whether risk factors such as loneliness, low autonomy/control, poor physical health, anxiety, eyesight/hearing loss, and experiences of discrimination act as mediators or moderators of the dementia-psychosis link. This was an analysis of the data of 7,575 adults aged 50 years old or over who took part in the 2021-2023 wave of the English Longitudinal Study of Ageing (ELSA) of whom 86 had dementia. Data were collected in computer-assisted interviews in participants' households. A moderated-mediated Generalized Linear Model showed that dementia did not predict the odds of psychosis. Dementia was associated with psychosis through loneliness, poor autonomy/control, poor life satisfaction, poor physical health and eyesight loss as mediating variables. Discrimination did not moderate the association between dementia and psychosis. The results support the Lancet Commission's recommendations about holistic approaches to dementia care. The results suggest that psychiatrists involved in dementia care should consider "social prescribing" of interventions that reduce patients' loneliness, increasing autonomy/control and life satisfaction through organized activities, employment or volunteering. Psychiatrists are encouraged to consider a range of problems (e.g., in vision/hearing) that may make patients feel more cognitively vulnerable and, thus, more at risk of psychosis.

Keywords: Autonomy; Dementia; Life satisfaction; Loneliness; Psychosis; Psychosocial risk factors.

Introduction

Psychiatrists need to recognize the risk of psychosis in patients with dementia, because a systematic review found that 34-63% of them suffer psychotic symptoms such as delusions and hallucinations [1], but little is known about whether psychosocial/health factors mediate the link between dementia and psychosis. Previous literature tended to focus on the link in the opposite direction by evaluating why people with mental disorders suffer an increased risk of dementia [2,3]. For instance, a longitudinal study of 1,711,386 people found that people with a mental disorder had a 4.24 times higher risk of developing dementia [3], but less is known about reasons why some people with dementia but no history of other mental disorders suffer from psychosis. Some authors have hypothesized that both dementia and psychosis are precipitated by cognitive decline, drawing from Kraepelin's dementia praecox theory which originally suggested that what is now called schizophrenia was a neurodegenerative condition akin to the early stages of dementia [2,4,5]. That theory has garnered recent support in brain magnetic resonance imaging research [6], but it remains unclear how psychosocial risk factors might contribute to the cognitive decline which begins with dementia and results in psychosis.

Previous literature highlighted the role of cognitive vulnerability in explaining the dementia-psychosis link [2], and therefore it is possible that impairments to social and personal functioning due to dementia might leave some patients suffering from loneliness, low autonomy, and poor life satisfaction, which in turn precipitates the onset of hallucinations, delusions and other psychotic symptoms because the impairments make patients more cognitively vulnerable. We explored whether the risk of psychosis among patients with dementia is higher when such psychosocial risk factors are present in acting as mediators.

Before introducing the psychosocial risk factors linking dementia and psychosis in more detail, we note that it is important for psychiatrists to treat symptoms of other mental

disorders such as anxiety, which is associated with a higher risk of psychotic symptoms such as persecutory delusions [7]. In essence, understanding and treating psychosis requires understanding what some authors called “multifactorial” risks [8]. Therefore, we explored whether patients with anxiety have a higher risk of psychosis, and conceptualized dementia, anxiety and psychosis as multiple factors which are interconnected.

We turn now to the question of psychosocial risk factors and note that high social isolation is common among patients with mental disorders [8], including dementia [9]. We therefore explored whether loneliness makes patients with dementia more like to suffer psychosis because being disconnected from other people has been found in imaging studies to make brain atrophy more likely in dementia [9]. In line with such findings and dementia praecox theory, it is plausible that the brain decline from loneliness in turn raises the risk of patients becoming dissociated from cognitive reality and, therefore, more at risk of hallucinations, delusions, and other psychotic symptoms.

Aside from loneliness, it is possible that some patients with dementia are likely to feel low life satisfaction, although previous research has found no significant differences between their life satisfaction levels and those of people without dementia. Instead, the study found that patients’ physical health and maintaining daily functioning were mediators [10], which led us to explore the idea that patients with dementia suffer reduced life satisfaction if they feel they have poor autonomy/control over their lives which, in turn, might increase the risk of psychosis. It remains unclear exactly what aspects of physical health are relevant to this, although one theoretical article proposed that metabolic syndrome explains the dementia-psychosis link by raising the risk of cerebrovascular diseases which in turn raises the risk of cognitive vulnerability [2]. However, that article’s aim was to theorize about the reasons why people with mental disorders have an increased risk of dementia (whereby the prevalence of metabolic syndrome is higher among people with mental disorders), rather than explaining why patients with dementia might be at increased risk of psychosis. Therefore, we did not

have sufficient evidence for specific hypotheses about metabolic syndrome, but we instead decided to explore the role of physical health more generally based on previous studies which highlight a range of conditions without allowing focus on specific predictions within our study [11-13]. We hypothesized that poor physical health in patients with dementia raises the risk of psychosis because it raises the risk of low life satisfaction and autonomy/control.

Aspects of physical health which might enable more precise hypotheses may include eyesight and hearing loss because we propose that these may make patients feel socially disconnected and thus more cognitively vulnerable to psychosis. Patients with dementia who suffer from visual impairments are more likely than those who have none to suffer from cognitive impairments [14], leading us to hypothesize that they raise the risk of psychosis. Whereas some evidence about the association between hearing impairments and the risk of psychosis is inconclusive [15], a meta-analysis found that hearing impairment was associated with 1.40 times the risk of hallucinations, 1.55 times the risk of delusions and 2.79 times the risk of psychotic disorders [16]. Studies have found that visual impairments are associated with cognitive decline in older adults [17], suggesting a higher risk of psychosis, but research is needed to clarify whether patients with dementia and hearing impairments suffer an increased risk of psychosis. It is possible that eyesight and hearing impairments increase levels of loneliness and poor life satisfaction which, in turn, increase the risk of psychosis, consistent with the social defeat hypothesis about factors such as loneliness which increase proneness to psychosis because of increased dopamine activity or sensitivity [18]. This idea is also consistent with dementia praecox theory [4-5] which views both psychosis and dementia as products of cognitive deterioration, and we suggest that visual and hearing impairments accelerate that process by making people with dementia more socially disconnected.

Finally, we added age as a control variable because older age is associated with a range of multi-comorbidities such as poorer physical health, a higher risk of social isolation (e.g., because being retired might involve less social contact than employment), dementia, and

visual impairments [13,19]. Having dementia might also be associated with experiencing discrimination, which evidence suggests may be associated with loneliness, lower autonomy and reduced life satisfaction [19], therefore we hypothesize that that in turn increases the risk of psychosis.

In summary, this study sought to explore a range of psychosocial and health risk factors that may mediate or moderate the association between dementia and psychosis in a complex theoretical model which pushed the literature beyond examining individual risk factors but towards a holistic understanding of the dementia-psychosis link. Except for our expectation about trends involving some factors (e.g., loneliness and visual/hearing impairments), it was not possible – based on the lack of previous studies about the topic – to formulate specific hypotheses. Instead, we took on an exploratory approach of testing our idea that psychosocial and health factors mediate the link between dementia and psychosis by comparing a series of theoretical models.

Methods

Participants

This was an analysis of data from 7,575 adults aged 50 years old or over who took part in the 2021-2023 wave of the English Longitudinal Study of Ageing (ELSA) [20]. There were 7,586 participants who originally took part in the ELSA; 0 had both dementia and schizophrenia, 0 had both dementia and bipolar depression, but 11 had both dementia and depression therefore these were excluded from further analysis, leading to a total of 7,575 participants, because such comorbidities are confounding variables in understanding factors associated with psychosis. As outlined within the introduction, there is evidence of a higher risk of dementia among people with a mental disorder [3], therefore our study sought to concentrate on only those participants who had no such mental health history. There were 3384 males (44.7%) and 4191 females (55.3%). The predictor variables in our theoretical

models were a diagnosis of dementia, anxiety, age, loneliness, life satisfaction, autonomy/control, paid employment, physical health, eyesight for recognizing a friend (i.e. familiar faces) and hearing. We assessed diagnosis of psychosis as the dependent variable.

Procedure and measures

ELSA study researchers collected data through computer-assisted interviews. The researchers obtained oral informed consent and full details of the method are provided within the data archive [20]. No identifying information was collected and ethical approval for the study was granted by the South Central Berkshire Research Ethics Committee. A chronic diagnosis of dementia was based on a diagnosis by a doctor or other health professional recorded in binary form (0=No, 1=Yes). A diagnosis of psychosis, bipolar (manic) depression and depression was based on participants reporting a diagnosis by a doctor or other health professional, recorded by the ELSA researchers with single-item binary questions (0=No, 1=Yes) that asked participants "*What type of emotional, nervous or psychiatric problems do you have?"* and those who said yes were asked to choose from a list. Paid employment in the past month was assessed with a single-item binary question (0= No meaning unemployed, 1= Yes meaning employed).

Eyesight for recognizing a friend was measured with a single-item question "*How good is your eyesight for recognizing a friend across the street?"* assessed on a 5-point Likert scale from 1= poor to 5= excellent. Higher scores indicated good eyesight for recognizing familiar faces far away. Hearing was measured with a single-item question "*How good is your hearing (while using hearing aid if appropriate)?*" assessed on a 5-point Likert scale from 1= poor to 5= excellent. Higher scores indicated good hearing. Self-reported physical health was also measured with a single-item question " *How good is your physical health?*" assessed on a 5-point Likert scale from 1= poor to 5= excellent. Higher scores indicated good physical health.

We were interested in measuring the levels of autonomy and control that patients displayed because of reasons discussed within the introduction. Therefore, we used the two 4-item sub-scales of the of autonomy (5 items) and control (6 items) of the CASP-19 scale [21] to measure those constructs. Example items are: "*My age prevents me from doing things I would like to do*"; "*I feel what happens to me is outside of my control*"; "*I feel free to plan for the future*" and "*I can do things that I want to do*" assessed on a 4-point Likert response scale from 1= never to 4= often. We selected autonomy and control specifically because these scales had items that were not similar to other variables in our study to prevent multicollinearity. Higher scores indicated higher self-perceptions of independence or autonomy and control. All items loaded well into one factor and the scale was reliable with a Cronbach alpha of 0.70.

Loneliness was measured with the 5-item Loneliness Scale [22], a shortened version of the Revised UCLA Loneliness Scale based on factor loadings. Example items are: "*How often do you feel you lack companionship?",* "*How often do you feel lonely?*" assessed on a 3-point Likert response scale from 1= hardly ever or never to 3= often. Higher scores indicated more loneliness. The scale showed acceptable reliability of 0.70.

Anxiety was measured using seven items in the General Anxiety Disorder (GAD-7) [23] which asked how often participants experienced symptoms of anxiety in the past two weeks. The scale included items such as "*Feeling nervous, anxious or on edge*"; "*Not being able to stop worrying*" and participants responded on a 4-point Likert response scale from 1= not at all to 4= nearly every day. Higher scores indicated more anxiety. Scores between 0-4 indicated minimal anxiety and scores between 5-9 indicated mild anxiety whereas scores between 10-14 indicate moderate anxiety and scores between 15-21 indicated severe anxiety. The scale showed an excellent reliability with a Cronbach alpha of 0.91.

Discrimination was assessed with the Shortened version (5 items) of the Everyday Discrimination Scale [24]. Example items are: "*You are treated with less courtesy/or respect*

than other people"; "*You receive poorer service than other people at restaurants or stores*"; "*You are threatened or harassed*". Participants responded using a 6-point Likert Scale from 1= never to 6= Almost every day. Higher scores indicated more perceptions of discrimination. The scale showed good reliability with a Cronbach alpha of 0.80.

Life satisfaction was assessed using the 5-items' Satisfaction with Life Scale (SWLS) [25] which has items such as "*I am satisfied with life*". Participants responded in a 7-point Likert response scale ranging from 1= strongly disagree to 7= strongly agree. Higher scores indicated higher life satisfaction. This scale showed good reliability with a Cronbach alpha of 0.89.

Statistical analyses

Statistical analyses were conducted in Jamovi using logistic regression, linear regression, and an advanced moderated-mediation Generalized Linear model (GLM) [26]. Sobel tests examined the statistical significance of mediations in the model. Bonferroni corrections were applied when interpreting multiple logistic or linear regressions involving the same outcome.

A moderation-mediation analysis approach was chosen to examine the associations between having a chronic diagnosis of dementia, the presence of psychosocial and health risk factors and psychosis. Thus, loneliness, autonomy/control, unemployment, physical health, life satisfaction and eyesight and hearing loss, were inserted as mediators of the relationship between dementia and psychosis given past literature discussed within the introduction supporting strong correlations between those risk factors and both dementia and psychosis. However, in order to determine the generalizability of these mechanisms or to explain a small significance effect, it is useful to investigate whether the relationships are observable in different subgroups of participants (e.g., high discrimination vs. low discrimination). Therefore, discrimination was inserted as a moderator of the direct and indirect relationship

between dementia and psychosis through mediating factors as there is considerably less evidence in favor of discrimination being correlated with dementia than with psychosis [27]. It is important to note that a moderated-mediation model does not demonstrate causality – it shows only that one variable is associated with another variable through a particular mechanism and that a third variable influences the relationship and thus assumptions about causation should be avoided. According to valid critiques of moderated- mediation analysis in research [28], it is acknowledged that moderated-mediation is not the only analytical approach that could be applied but this approach was used to advance existing knowledge about whether psychosocial/health factors explain the link between dementia and psychosis. After testing for the normality of the distributions of our data, which showed some non-normal distributions, GLM remained our chosen main method of statistical analysis because it can tolerate non-normally distributed data as well as both continuous and categorical variables, which suited the dataset that was examined. The Bonferroni corrected family-wise error rate (FWER) was used to reduce the risk of false positives and Type 1 errors. The adjusted statistical significance level of 0.029 was applied within the GLM because of the low count of participants in some associations and to control for Type 1 errors.

Results

Descriptives and normality of distribution checks for all the variables are presented in Table 1 which shows high incidences of unemployment, and hearing difficulties. Eighty-six (1%) participants reported a diagnosis of dementia confirmed by a doctor or other health professional. Twelve (0.2%) participants reported a diagnosis of psychosis.

insert Table 1 around here

Logistic regression showed that people with dementia did not have higher odds of being diagnosed with psychosis (β=17.1, p=0.999). Further linear regressions showed that dementia was associated with poorer life satisfaction (β=-4.14, p<0.001); loneliness (β=1.17, p=0.002); poorer autonomy/control (β=-3.26, p<0.001); poorer eyesight for recognizing a friend

(β=0.63, p<0.001); poorer hearing even if wearing a hearing aid, if applicable, (β=-0.68, p<0.001) and poorer physical health (β=-0.84, p<0.001). A further logistic regression showed that people with dementia had higher odds of being unemployed (β= -2.13, p=0.003). In contrast, people with dementia were not likely to experience higher levels of discrimination compared to people without it (β=-0.75, p=0.15). Findings about significant differences between patients with/without dementia remained under the threshold for significance after a Bonferroni correction for multiple comparisons, where p should be less than 0.006 (which is 0.05 divided by 9 comparisons).

Logistic regressions showed significant associations between psychosis and loneliness (β=0.3, p=0.02), life satisfaction (β=-0.10, p=0.018), autonomy/control (β=-0.12, p=0.019), eyesight (β=0.88, 0.002), and general health (β=-0.901, p=0.002). There were no significant associations between psychosis and experiences of discrimination, anxiety, unemployment or hearing, p >0.05. After a Bonferroni correction for 9 comparisons, p should be less than 0.006, therefore the significant associations were only those between psychosis and eyesight, as well as between psychosis and general health.

A Generalized Linear moderated-mediation model was performed in Jamovi with diagnosis of dementia, anxiety and age as predictors of a diagnosis of psychosis with life satisfaction, loneliness, autonomy/control, paid employment, eyesight for recognizing a friend, hearing and physical health as mediators (see Figure 1). Discrimination was inserted as a moderator of these relationships. As it can be seen in Table 2, anxiety, dementia and age were not directly associated with psychosis, but there were statistically significant mediation pathways. Dementia was statistically significantly associated with psychosis through loneliness, poorer life satisfaction, poorer autonomy/control, poorer eyesight for recognizing a friend, and poorer physical health. Anxiety was also associated with psychosis through poorer life satisfaction, poorer autonomy/control, poorer eyesight for recognizing a friend and poorer physical health.

Furthermore, results in Table 2 show that the older the participant, the higher were the odds of psychosis when loneliness, poorer life satisfaction, poorer autonomy/control, poorer eyesight for recognizing a friend, unemployment and poorer physical health were also present. Finally, there were also some moderator effects of discrimination on the relationships between anxiety and unemployment, and older age and poorer autonomy and control. Also, discrimination moderated the relationships between poor life satisfaction and psychosis, and between poor autonomy/control and psychosis.

* insert Table 2 around here*

* insert Figure 1 around here*

Discussion

This study shed light on the factors that can explain the association between dementia and psychosis, thus advancing knowledge reported in previous studies which focused on highlighting the high incidences of psychosis among patients with dementia [1]. To our knowledge, this is the first study to shed light on moderating and mediating factors. Results also showed that people with dementia do not have a higher risk of psychosis, but rather that certain factors can explain why dementia could be associated with psychosis. Results showed that the dementia-psychosis link is mediated by certain psychosocial and health risk factors. These include loneliness, poorer life satisfaction, autonomy and control, poor physical health, and eyesight loss. Anxiety was not directly associated with psychosis, but was indirectly associated with it through poorer life satisfaction, loneliness, poor autonomy/control, poor physical health and eyesight loss. Discrimination did not moderate the relationship between dementia and psychosis but moderated the relationships between anxiety and younger age and unemployment, so that the people that showed more anxiety, were younger and that showed more discrimination had the higher odds of being unemployed than those who were older and had less anxiety and faced less discrimination. Furthermore, discrimination also moderated the relationships between older age and showing poorer autonomy/control, so that

those individuals who were older and who faced more discrimination, showed the higher odds of having poorer autonomy and control. In summary, the results highlight the role of certain psychosocial and health risk factors which can be addressed by psychiatrists and other clinicians.

Clinical implications

Psychiatrists should use these results to develop integrated treatment approaches for patients with dementia who present with psychosis using holistic approaches such as "social prescribing" which addresses patients' loneliness, life satisfaction, unemployment, eyesight loss, autonomy and physical health. Training psychiatrists about integrated approaches is important to them [29], and can include helping psychiatrists recognize the importance of referring patients with mental disorders to schemes which support their employment because it can reduce loneliness, increase life satisfaction, and autonomy [30,31]. Working-age patients with dementia are estimated to be in their thousands in countries such as the UK [32], and there may be many in countries within Africa and the Middle East where few have pensions and older age poverty is common [33], therefore many might continue employment even after developing dementia. We suggest that such approaches can address not just loneliness, but patients' need for more autonomy/control within their lives and life satisfaction.

Psychiatrists and other healthcare professionals should also monitor the hearing and eyesight loss of patients with dementia because there are studies to suggest that hearing and visual aids improve the prognosis of patients with dementia [34]. Addressing hearing and eyesight loss will also improve patients' life satisfaction, autonomy and loneliness and prevent further cognitive decline, which in its turn may pave the way for psychosis [35].

Psychiatrists and healthcare professionals should also address the coping skills of patients with dementia and empower them with strategies for feeling more involved with their care/treatment, thus promoting their sense of autonomy. Indeed, there is research to

support the idea that patients with dementia and psychosis with an increased sense of agency, autonomy and control have a better prognosis and cope better than those who do not [36,37].

Limitations

One limitation of this study was that ELSA researchers did not investigate the type of dementia the patients were diagnosed with. Future research should enable comparisons according to the type of dementia because a systematic review found that 11-78% of people with Dementia with Lewy Bodies (DLB) reported hallucinations, compared to 13-50% of people with vascular dementia, 3-18% of people with frontotemporal dementia, and 3-30% of people with Alzheimer's disease [1]. People with DLB were also more likely to report delusions [1]. Across different types of dementia, the most common delusions are of things having been stolen, and being persecuted, believing that someone has insulted them whereas less common were Capgras and somatic delusions. ELSA researchers need to clarify whether participants received a diagnosis of dementia from a doctor/health professional with appropriate expertise, given the risk that they may have presented with mild or moderate rather than severe dementia. A related limitation of this study was that ELSA researchers did not assess the presence of delirium in patients with dementia whereas past research found that delirium is associated with psychotic symptoms in dementia [38-40], suggesting that the interplay between delirium, dementia and psychosis should be assessed in future research. The low count of patients with dementia impaired the generalizability of results. It is possible that cases of dementia and psychosis were under-recognized because of anosognosia, which is where people with such conditions lack insight or awareness about their symptoms and thus do not seek help or get professionally diagnosed.

We encourage future ELSA researchers to record more types of psychotic disorders within their interviews of participants and use of their medical histories. Although they did record schizophrenia, they excluded other types such as brief psychotic disorder, and relied on diagnoses by doctors/health professionals who may not have been psychiatrists trained in

use of the DSM. Therefore, it was not possible to determine whether or not the participants suffered psychotic symptoms that met the DSM-V-TR threshold for diagnosis, based on symptom frequency, severity and the extent to which they cause clinically significant disturbance or distress. The expertise of psychiatrists is vital within diagnosis. For instance, information about the presence of symptoms such as paranoid ideation would have been helpful in enabling us to explore its association with some of the variables within our study, such as participants' feelings about experiencing everyday discrimination.

This study has a cross-sectional design and, as such, causality cannot be inferred. It is possible that, rather than hearing or eyesight loss contributing to psychosis, psychosis might actually lead to self-neglect by making people not seek help about correctable hearing/sight problems. Likewise, rather than loneliness leading to psychosis, it is plausible that suffering psychosis leads to self-isolation or withdrawal from others. Future research should therefore examine longitudinal effects to clarify how loneliness, unemployment, physical health, eyesight and hearing loss are associated with psychosis in patients with dementia, also considering the role of certain health conditions such as cancer because of previous research which found associations with the risk of hallucinations [41]. The effects of brain-based and heart-related conditions should also be assessed because of previous literature suggesting that metabolic syndrome and cerebrovascular health can explain the dementia-psychosis link [2], and previous research which found that some types of mental ill health are linked with cardiovascular health [42]. Longitudinal research can also be helpful in shedding light on the theoretical perspective, which we outlined in our introduction, proposing that dementia is associated with an increased risk of psychosis because it makes patients cognitively vulnerable to hallucinations, delusions and other psychotic symptoms. Long-term follow-up of patients with dementia can help track the associations among dementia, cognitive decline and psychosis.

Conclusions

The findings highlighted the need for a holistic approach toward the care of patients with dementia, supporting the approach recommended by the Lancet Commission on dementia prevention, intervention, and care in 2024 [43]. The Commission assessed evidence to determine that there 14 modifiable risk factors associated with almost half of the risk of someone developing dementia, and our study lends weight to the Commission's inclusion of vision impairments, hearing impairments, infrequent social contact and physical health. Our results support their guidelines encouraging a holistic approach which ranges from providing hearing aids and treatment for visual impairments to treating depression and addressing physical health problems such as depression. Our study additionally illustrates the role of psychiatrists in addressing psychological factors such as poor autonomy/control, life satisfaction and psychosis within dementia treatment and care.

References

[1] Pessoa RMP, Maximiano-Barreto MA, Lambert L, Leite ÉDM, Chagas MHN. The frequency of psychotic symptoms in types of dementia: a systematic review. Dement Neuropsychol. 2023;17:e20220044. https://doi.org/10.1590/1980-5764-DN-2022-0044

[2] Jonas K, Abi-Dargham A, Kotov R. Two Hypotheses on the High Incidence of Dementia in Psychotic Disorders. JAMA Psychiatry. 2021;78(12):1305-1306. https://doi.org/10.1001/jamapsychiatry.2021.2584

[3] Richmond-Rakerd LS, D'Souza S, Milne BJ, Caspi A, Moffitt TE. Longitudinal Associations of Mental Disorders With Dementia: 30-Year Analysis of 1.7 Million New Zealand Citizens. JAMA Psychiatry. 2022;79(4):333–340. https://doi.org/10.1001/jamapsychiatry.2021.4377

[4] Kendler KS. Kraepelin's Final Views on Dementia Praecox. Schizophr Bull. 2021;47(3):635-643. https://doi.org/10.1093/schbul/sbaa177

[5] Adityanjee, Aderibigbe YA, Theodoridis D, Vieweg VR. Dementia praecox to schizophrenia: the first 100 years. Psychiatry Clin Neurosci. 1999;53(4):437-48. https://doi.org/10.1046/j.1440-1819.1999.00584.x

[6] Koutsouleris N, Pantelis C, Velakoulis D, et al. Exploring links between psychosis and frontotemporal dementia using multimodal machine learning: dementia praecox revisited. JAMA Psychiatry. 2022;79(9):907–919. https://doi.org/10.1001/jamapsychiatry.2022.2075

[7] Startup H, Freeman D, Garety PA. Persecutory delusions and catastrophic worry in psychosis: developing the understanding of delusion distress and persistence. Behav Res Ther. 2007;45(3):523-37. https://doi.org/10.1016/j.brat.2006.04.006

[8] O'Connor RC, Worthman CM, Abanga M et al. Gone too soon: priorities for action to prevent premature mortality associated with mental illness and mental distress. Lancet Psych. 2023;10:452-464.https://doi.org/10.1016/S2215-0366(23)00058-5

[9] Karska J, Pszczołowska M, Gładka A, Leszek J. Correlations between Dementia and Loneliness. *Int J Mol Sci.* 2023;25(1):271. doi: 10.3390/ijms25010271.

[10] Gotanda H, Tsugawa Y, Xu H, Reuben DB. Life satisfaction among persons living with dementia and those without dementia. J Am Geriatr Soc. 2023;71(4):1105-1116. doi: 10.1111/jgs.18174.

[11] Pearce J, Rafiq S, Simpson J, Varese F. Perceived discrimination and psychosis: a systematic review of the literature. Soc Psychiatry Psychiatr Epidemiol. 2019; 54(9):1023-1044. https://doi.org/10.1007/s00127-019-01729-3

[12] Houben N, Janssen EPCJ, Hendriks MRC, van der Kellen D, van Alphen BPJ, van Meijel B. Physical health status of older adults with severe mental illness: The PHiSMI-E cohort study. Int J Ment Health Nurs. 2019;28(2):457-467. https://doi.org/10.1111/inm.12547

[13] Fabbri E, An Y, Zoli M, et al. Association Between Accelerated Multimorbidity and Age-Related Cognitive Decline in Older Baltimore Longitudinal Study of Aging Participants without Dementia. J Am Geriatr Soc. 2016;64(5):965-72. https://doi.org/10.1111/jgs.14092

[14] Bowen M, Edgar DF, Hancock B, Haque S, Shah R, Buchanan S, et al. The Prevalence of Visual Impairment in People with Dementia (the PrOVIDe study): a cross-sectional study of people aged 60–89 years with dementia and qualitative exploration of individual, carer and professional perspectives. Health Soc Care Deliv Res 2016;4(21). https://doi.org/10.3310/hsdr04210

[15] Köhler S, van Os J, de Graaf R, Vollebergh W, Verhey F, Krabbendam L. Psychosis risk as a function of age at onset: a comparison between early- and late-onset psychosis in a general population sample. Soc Psychiatry Psychiatr Epidemiol. 2007;42(4):288-94. https://doi.org/10.1007/s00127-007-0171-6

[16] Linszen MM, Brouwer RM, Heringa SM, Sommer IE. Increased risk of psychosis in patients with hearing impairment: Review and meta-analyses. Neurosci Biobehav Rev. 2016;62:1-20. https://doi.org/10.1016/j.neubiorev.2015.12.012

[17] Nagarajan N, Assi L, Varadaraj V, et al. Vision impairment and cognitive decline among older adults: a systematic review. BMJ Open. 2022;12(1):e047929. https://doi.org/10.1136/bmjopen-2020-047929

[18] Selten JP, Cantor-Graae E. Social defeat: risk factor for schizophrenia? Br J Psychiatry. 2005;187:101-2. https://doi.org/10.1192/bjp.187.2.101.

[19] Nkwata AK, Zhang M, Song X, Giordani B, Ezeamama AE. Toxic Psychosocial Stress, Resiliency Resources and Time to Dementia Diagnosis in a Nationally Representative Sample of Older Americans in the Health and Retirement Study from 2006-2016. Int J Environ Res Public Health. 2022; 19(4):2419. doi: 10.3390/ijerph19042419.

[20] Banks J, Batty GD, Breedvelt J, et al. English Longitudinal Study of Ageing: Waves 0-10, 1998-2023. [data collection]. 40th Edition. UK Data Service. SN: 5050. Accessed September 10, 2024. http://doi.org/10.5255/UKDA-SN-5050-27

[21] Hyde M, Wiggins RD, Higgs P, Blane, DB. A measure of quality of life in early old age: the theory, development and properties of a needs satisfaction model (CASP-19). Aging Ment Health. 2003;7(3):186-94. https://doi.org/10.1080/1360786031000101157

[22] Hughes ME, Waite LJ, Hawkley LC, Cacioppo JT. A Short Scale for Measuring Loneliness in Large Surveys: Results From Two Population-Based Studies. Res Aging. 2004;26(6):655-672. https://doi.org/10.1177/0164027504268574

[23] Spitzer RL, Kroenke K, Williams JB, et al. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med. 2006; 166(10):1092-7. https://doi.org/10.1001/archinte.166.10.1092

[24] Sternthal MJ, Slopen N, Williams DR. Racial disparities in health: how much does stress really matter? Du Bois Rev. 2011; 8(1):95-113. https://doi.org/10.1017/S1742058X11000087

[25] Diener E, Emmons RA, Larsen RJ, Griffin S. The Satisfaction With Life Scale. J Pers Assess. 1985;49(1):71-5. https://doi.org/10.1207/s15327752jpa4901_13

[26] Gallucci M. JAMM: jamovi Advanced Moderation Mediation Models. Accessed September 10, 2024. https://www.jamovi.org

[27] Pascoe EA, Smart Richman L. Perceived discrimination and health: a meta-analytic review. Psychol Bull. 2009;135(4):531-54. https://doi.org/10.1037/a0016059

[28] Tate CU. On the overuse and misuse of mediation analysis: It may be a matter of timing. Basic and App Soc Psych. 37(4): 235–246. https://doi.org/10.1080/01973533.2015.1062380

[29] Kamau C. Outcomes of care programme approach, dual diagnosis, carer support and psychological therapy inductions. Psychiatr Bull. 2014;38(4):172-4. https://doi.org/10.1192/pb.bp.113.045526

[30] Kamau-Mitchell C, Lopes B. Importance of occupational support for NHS patients with mental illness. Occup Med. 2023;73(9):528-31. https://doi.org/10.1093/occmed/kqad115

[31]. Kamau-Mitchell C, Lopes B. Mental illness and unemployment-related mortality. Lancet Psychiatry. 2023;10(8):583-584. https://doi.org/10.1016/S2215-0366(23)00201-8

[32] Thomson L, Stanyon M, Dening T, Heron R, Griffiths A. Managing employees with dementia: a systematic review. Occup Med. 2019;69(2):89-98. https://doi.org/10.1093/occmed/kqy161

[33] Kamau-Mitchell C. Global implications of deprivation, hospitalization and mortality. QJM. 2024;117(6):476-477. https://doi.org/10.1093/qjmed/hcae049

[34] Allen NH, Burns A, Newton V, et al. The effects of improving hearing in dementia. Age Ageing. 2003;32(2):189-93. https://doi.org.10.1093/ageing/32.2.189

[35] Guarnera J, Yuen E, Macpherson H. The Impact of Loneliness and Social Isolation on Cognitive Aging: A Narrative Review. J Alzheimers Dis Rep. 2023;7(1):699-714. https://doi.org/10.3233/ADR-230011

[36] Halse I, Bjørkløf GH, Engedal K, Selbæk G, Barca ML. Control Beliefs among People with Dementia: A Systematic Review. Dement Geriatr Cogn Disord. 2022; 50(3):205-223. https://doi.org/10.1159/000516789

[37] Pons EV, Salvador-Carulla L, Calcedo-Barba A, et al. The capacity of schizophrenia and bipolar disorder individuals to make autonomous decisions about pharmacological treatments for their illness in real life: A scoping review. Health Sci Rep. 2020;3(3):e179. https://doi.org/10.1002/hsr2.179

[38] Morandi A, Inzitari M, Udina C, et al. Italian Study Group of Delirium. Visual and Hearing Impairment Are Associated With Delirium in Hospitalized Patients: Results of a Multisite Prevalence Study. J Am Med Dir Assoc. 2021;22(6):1162-1167.e3. https://doi.org/10.1016/j.jamda.2020.09.032

[39] Fick DM, Agostini JV, Inouye SK. Delirium superimposed on dementia: a systematic review. J Am Geriatr Soc. 2002;50(10):1723-32. https://doi.org/10.1046/j.1532-5415.2002.50468.x

[40] Charlton BG, Kavanau JL. Delirium and psychotic symptoms--an integrative model. Med Hypotheses. 2002;58(1):24-7. https://doi.org/10.1054/mehy.2001.1436

[41] Kamau-Mitchell C, Lopes B. Increased risk of hallucinations among people with cancer: Role of loneliness, job satisfaction, sleep and a moderated-mediated model of anxiety and life

satisfaction. J Psychiatr Res. 2024 Dec 1;180:113-20. https://doi.org/10.1016/j.jpsychires.2024.09.041

[42] Lopes B, Kamau-Mitchell C. Anxiety, depression, working from home and health-related behaviours during COVID-19: Structural equation modelling and serial mediation of associations with angina, heart attacks and stroke. J Health Psych. 2024 Oct;29(12):1390-403. https://doi.org/10.1177/13591053241241

[43] Livingston G, Huntley J, Liu KY, Costafreda SG, Selbæk G, Alladi S, Ames D, Banerjee S, Burns A, Brayne C, Fox NC. Dementia prevention, intervention, and care: 2024 report of the Lancet standing Commission. The Lancet. 2024 Aug 10;404(10452):572-628. https://doi.org/10.1016/S0140-6736(24)01296-0

Table 1. Descriptive statistics

Variables	**M**	**SD**	**Minimum**	**Maximum**	**Skewness**	**Kurtosis**
Loneliness	7.51	2.33	1	15	0.87	0.30
Discrimination	7.46	3.24	1	28	1.79	3.97
Autonomy/control	26.8	5.10	1	36	-0.72	1.20
Life Satisfaction	32.3	5.64	1	40	-1.21	2.09
Eyesight (recognising a friend)	3.24	0.94	1	5	-0.40	-0.17
Hearing (while using hearing aid if applicable)	3.39	1.11	1	5	-0.21	-0.70
Physical health	3.17	1.11	1	5	-0.20	-0.64
Anxiety	10.3	4.20	1	28	1.53	2.46
Age	67.6	9.75	26	89	0.04	-0.58
Diagnosis of Dementia	**Yes**	**No**			9.22	83.1
	n=86 (1.1%)	*n*=7484 (98.9%)				
Diagnosis of Psychosis	**Yes**	**No**			23.1	53.2
	n=12 (0.2%)	*n*=6433 (99.8%)				
Paid employment	**Yes**	**No**			0.79	-1.38
	n=1997 (31.6%)	*n*=4318 (68.4%)				
Difficulty hearing conversation with background noise	**Yes**	**No**			0.32	-1.90
	n=3037 (42.2%)	*n*=4156 (57.8%)				
Levels of Anxiety	**Minimal**	**Mild**	**Moderate**	**Severe**		
	n=40 (0.5%)	*n*=3472 (46%)	*n*=1938 (26%)	*n*=708 (9.3%)		

Table 2. Moderating effects of discrimination for the direct and indirect pathways between the main predictors (diagnosis of dementia, anxiety and age) and the dependent variable (diagnosis of psychosis) through the mediators of loneliness, life satisfaction, autonomy/control, paid employment, eyesight for recognizing a friend, hearing and physical health

Moderating Effects (Interactions) of Discrimination	***β***	***S.E.***	***95% CI***	***Z***	***P***
Moderator effects of discrimination for dementia and psychosocial and health factors: *n*=86					
Dementia (predictor) x Discrimination->Loneliness (mediator)	0.22	0.17	-0.02, 0.66	1.84	0.066
Dementia (predictor) x Discrimination-> Autonomy/Control (mediator)	0.09	0.38	-0.44, 1.03	0.79	0.43
Dementia (predictor) x Discrimination-> Paid employment (mediator)	-0.04	0.03	-0.05, 0.05	-0.35	0.73
Dementia (predictor) x Discrimination-> Life satisfaction (mediator)	0.12	0.42	-0.42, 1.22	0.96	0.34
Dementia (predictor) x Discrimination-> Eyesight (recognizing a friend) (mediator)	-0.06	0.08	0.12, 0.20	-0.50	0.61

Dementia (predictor) x Discrimination-> Hearing (mediator)	-0.03	0.09	-0.20, 0.16	-0.23	0.82
Dementia (predictor) x Discrimination-> Physical health (mediator)	-0.22	0.09	-0.03,0.33	-1.67	0.093
Moderator effects of discrimination for anxiety, age and psychosocial and health factors: *n*=7,575					
Anxiety (predictor) x Discrimination ->Loneliness (mediator)	0.00	0.00	-0.00, 0.00	0.10	0.91
Age (predictor) x Discrimination -> Loneliness (mediator)	0.00	0.00	0.00, 0.00	0.49	0.63
Anxiety (predictor) x Discrimination-> Life satisfaction (mediator)	-0.03	0.00	-0.02, 3.05	-1.89	0.058
Age (predictor) x Discrimination -> Life satisfaction (mediator)	0.03	0.00	3.85. 0.00	2.12	**0.034**[a]
Anxiety (predictor) x Discrimination-> Autonomy/Control (mediator)	-0.01	0.00	-0.00, 0.01	-0.77	0.44
Age (predictor) x Discrimination -> Autonomy/Control	0.03	0.00	0.00, 0.00	2.66	**0.011**
Anxiety (predictor) x Discrimination -> Paid employment (mediator)	-0.03	3.63	-0.00, -2.52	-2.66	**0.008**
Age (predictor) x Discrimination -> Paid employment	-0.03	1.75	-8.18, -1.33	-2.72	**0.006**
Anxiety (predictor) x Discrimination->Eyesight (recognizing a friend) (mediator)	-0.02	8.67	-0.00, 5.41	-1.34	0.18

Age (predictor) x Discrimination-> Eyesight (recognizing a friend) (mediator)	0.00	4.18	-6.34, 0.00	0.44	0.66
Anxiety (predictor) x Discrimination-> Hearing (mediator)	-0.01	0.00	-9.73, 0.00	-0.99	0.32
Age (predictor) x Discrimination-> Hearing (mediator)	-0.00	4.82	-0.00, 7.98	-0.30	0.76
Anxiety (predictor) x Discrimination ->Physical health (mediator)	-0.02	9.64	-0.00, 8.65	-1.06	0.29
Age (predictor) x Discrimination-> Physical health (mediator)	-0.02	4.64	-9.05, 0.00	1.77	0.078
Moderator effects of discrimination for dementia, anxiety, age, psychosocial and health risk factors and psychosis: *n*=12					
Dementia (predictor) x Discrimination-> Psychosis (dependent variable)	-0.01	0.00	-0.00, 0.00	-0.10	0.92
Anxiety (predictor) x Discrimination-> Psychosis (dependent variable)	0.00	4.42	-7.35, 9.95	0.30	0.77
Age (predictor) x Discrimination -> Psychosis (dependent variable)	-0.04	2.35	-9.16, 4.98	-1.94	0.049*
Loneliness (mediator) x Discrimination-> Psychosis (dependent variable)	0.10	8.70	3.14, 2.73	1.64	0.10

Life Satisfaction (mediator) x Discrimination-> Psychosis (dependent variable)	-0.35	4.10	-2.22, -6.13	-3.46	**<0.001**
Autonomy/Control (mediator) x Discrimination-> Psychosis	-0.38	4.71	9.69, 2.81	-4.02	**<0.001**
Paid employment (mediator) x Discrimination-> Psychosis	-0.05	4.73	-0.00, -9.67	-2.17	0.030*
Eyesight (recognizing a friend) (mediator) x Discrimination-> Psychosis	-0.07	1.93	-6.38, 1.18	-1.35	0.18
Hearing (mediator) x Discrimination-> Psychosis	-0.00	1.80	-3.37, -3.70	-0.09	0.93
Physical health (mediator) x Discrimination->Psychosis	-0.01	1.95	-4.34, 3.32	-0.26	0.80
Direct pathways between dementia and psychosis, age and psychosis and anxiety and psychosis: *n*=12	***β***	***S.E.***	***95% CI***	***Z***	***P***
Dementia (predictor) -> Psychosis (dependent variable)	0.00	0.02	0.03, 0.03	0.06	0.95
Anxiety (predictor)-> Psychosis (dependent variable)	0.02	1.70	1.38, 5.30	1.15	0.25
Age (predictor) -> Psychosis (dependent variable)	-0.04	-7.99	-3.16, 2.98	-1.99	0.046*
Loneliness (mediator)->Psychosis (dependent variable)	0.04	2.75	1.40, 0.00	2.47	**0.013**
Life satisfaction (mediator)-> Psychosis (dependent variable)	-0.04	1.15	-1.03, 5.53	-2.86	**0.004**

Autonomy/Control (mediator)->Psychosis (dependent variable)	-0.08	1.28	-9.11, -4.10	-5.17	**<0.001**
Paid employment (mediator)-> Psychosis (dependent variable)	-0.06	0.00	-0.01, -0.00	-6.02	**<0.001**
Eyesight (recognizing a friend) (mediator)-> Psychosis (dependent variable)	-0.05	5.96	-0.00, -0.00	-3.84	**<0.001**
Hearing (mediator)-> Psychosis (dependent variable)	-0.04	6.44	6.58, 0.03	-2.98	**0.003**
Physical health (mediator) -> Psychosis (dependent variable)	-0.90	0.09	-1.48, -0.33	-3.07	**0.002**
Direct pathways between dementia and psychosocial and health factors: *n*=86					
Dementia (predictor)-> Loneliness (mediator)	0.06	0.80	0.46, 3.63	2.53	**0.012**
Dementia (predictor)-> Life satisfaction (mediator)	-0.04	1.30	-5.44, 0.34	-2.21	**0.026**
Dementia (predictor)-> Autonomy/Control (mediator)	-0.04	1.17	-5.02, -0.44	-2.34	**0.019**
Dementia (predictor)-> Paid employment (mediator)	-0.04	0.09	-0.41, -0.04	-2.40	**0.016**
Dementia (predictor)-> Eyesight (recognizing a friend) (mediator)	-0.05	0.24	-1.11, -0.18	-2.74	**0.006**
Dementia (predictor)-> Hearing (mediator)	-0.05	0.28	-1.23, 0.14	-2.46	**0.014**
Dementia (predictor)-> Physical health (mediator)	-0.08	0.28	-1.70,-0.61	-4.16	**<0.001**

Direct pathways between anxiety, age and psychosocial and health factors: *n*=7575					
Anxiety (predictor)-> Loneliness (mediator)	0.39	0.01	0.20, 0.25	21.22	**<0.001**
Anxiety (predictor)-> Life satisfaction (mediator)	-0.32	0.03	-0.48,-0.38	-16.87	**<0.001**
Anxiety (predictor)-> Autonomy/Control (mediator)	-0.36	0.02	-0.50, -0.41	-20.10	**<0.001**
Anxiety (predictor)-> Paid employment (mediator)	-0.06	0.00	0.00, -0.01	-2.47	**0.014**
Anxiety (predictor)-> Eyesight (recognising a friend) (mediator)	-0.05	0.00	-0.02, -0.00	-2.76	**0.006**
Anxiety (predictor)-> Hearing (mediator)	-0.04	0.00	-0.02, 0.00	-2.27	**0.023**
Anxiety (predictor)->Physical health (mediator)	-0.18	0.00	-0.06, -0.04	-9.41	**<0.001**
Age (predictor)->Loneliness (mediator)	0.39	0.10	0.20, 0.25	0.25	**<0.001**
Age (predictor) -> Life satisfaction (mediator)	-0.32	0.03	-0.48,-0.38	-16.87	**<0.001**
Age (predictor)-> Autonomy/Control (mediator)	-0.23	0.00	-0.13, 0.10	-13.40	**<0.001**
Age (predictor)-> Paid employment (mediator)	-0.55	7.83	-0.03, 0.03	-34.43	**<0.001**
Age (predictor)-> Eyesight (recognizing a friend) (mediator)	-0.17	0.00	-0.02, 0.01	-8.69	**<0.001**

Age (predictor)-> Hearing (mediator)	-0.27	0.00	-0.03, 0.03	-14.17	**<0.001**		
Age (predictor)-> Physical health (mediator)	-0.28	0.00	-0.04, 0.03	-15.10	**<0.001**		
Indirect Pathways *n*=12	***β***	***S.E.***	***95% CI***	***Z***	***P***	***Sobel test***	***P***
Dementia-> loneliness-> psychosis	0.002	0.00	-0.00, -3.01	2.20	**0.028**	1.90	0.049*
Dementia-> life satisfaction-> psychosis	-0.002	6.56	0.00, 2.36	-2.32	**0.020**	2.20	**0.028**
Dementia-> autonomy/control-> psychosis	-0.002	8.47	1.45, 0.00	-2.13	**0.027**	2.05	**0.028**
Dementia-> paid employment-> psychosis	-0.001	4.60	-1.79, 0.00	1.57	0.12	1.49	0.14
Dementia-> eyesight (recognising a friend)-> psychosis	-0.004	2.78	-2.94, 7.94	-4.98	**0.010**	3.23	**0.001**
Dementia-> hearing-> psychosis	-0.001	6.94	-0.00, 4.52	-0.76	0.44	0.72	0.47
Dementia->physical health->psychosis	-0.004	4.00	-0.00, 3.37	-4.50	**0.015**	3.12	**0.001**
Anxiety-> loneliness-> psychosis	0.002	6.24	1.69, 7.55	2.00	0.45	2.31	**0.021**
Anxiety-> life satisfaction-> psychosis	-0.03	5.65	1.54, -3.75	-4.68	**<0.001**	2.49	**0.013**
Anxiety-> autonomy/control-> psychosis	-0.02	5.71	-3.36, -1.12	-3.92	**<0.001**	3.24	**<0.001**
Anxiety-> paid employment-> psychosis	-0.004	1.58	-1.19, -7.37	-2.71	**0.007**	3.20	**<0.001**

Anxiety-> eyesight (recognising a friend)-> psychosis	-0.004	1.53	-1.74, -7.72	-3.10	**0.002**	3.03	**0.002**
Anxiety-> hearing-> psychosis	0.000	0.17	-0.00, 0.00	0.90	0.60	1.80	0.071
Anxiety->physical health->psychosis	-0.03	6.70	-1,85, -4.23	-5.00	**<0.001**	3.10	**0.002**
Age->loneliness-> psychosis	0.003	6.26	1.61, 2.61	2.22	**0.027**	2.30	**0.021**
Age -> life satisfaction-> psychosis	-0.007	1.14	.5,37, -8.95	-2.74	**0.006**	2.50	**0.012**
Age-> autonomy/control-> psychosis	-0.02	1.60	-4.59, -1.09	-4.82	**<0.001**	3.00	**0.002**
Age -> paid employment -> psychosis	-0.06	4.31	-1.72, -3.41	-5.94	**<0.001**	4.00	**<0.001**
Age -> eyesight (recognizing a friend) -> psychosis	-0.01	9.97	-1.51, -5.42	-3.48	**<0.001**	3.03	**0.002**
Age-> hearing -> psychosis	-0.00	3.10	-2.59, -9.57	1.12	0.26	0.73	0.46
Age-> physical health -> psychosis	-0.04	4.07	-7.69, -2.36	-3.85	**<0.001**	3.10	**0.002**

[a] Statistically significant effects are in bold; * Not statistically significant when the Bonferroni's family-wise error rate corrected statistically significance level of 0.029 is used

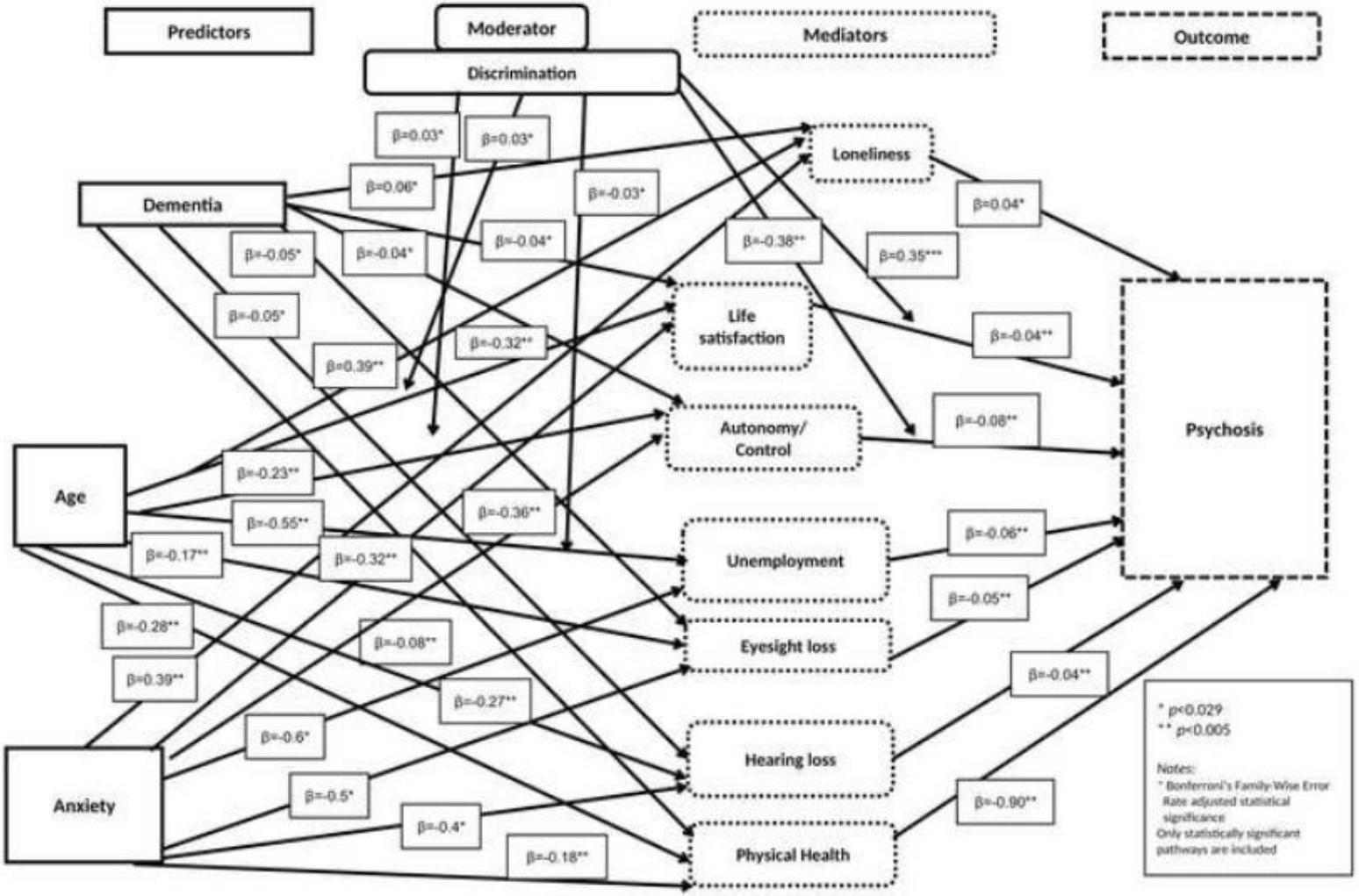

Figure 1 caption. Moderated-mediation model showing that dementia is associated with psychosis when loneliness, poor autonomy/control, poor eyesight for recognizing a friend, poor hearing, poor life satisfaction and poor physical health are also present.