



The prevalence of tinnitus and the relationship with neuroticism in a middle-aged UK population



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ARTICLE INFO

Article history:

Received 10 July 2013

Received in revised form 23 August 2013

Accepted 26 August 2013

Keywords:

Epidemiology
Neuroticism
Older adults
Personality
Tinnitus

ABSTRACT

Background: Previous research has suggested that a substantial proportion of the population are severely affected by tinnitus, however recent population data are lacking. Furthermore, there is growing evidence that the perception of severity is closely related to personality factors such as neuroticism.

Objective: In a subset ($N = 172,621$) of a large population sample of >500,000 adults aged 40 to 69 years, (from the UK Biobank dataset) we calculated the prevalence of tinnitus and that which is perceived as bothersome, and examined the association between tinnitus and a putative predisposing personality factor, neuroticism.

Method: Participants were recruited through National Health Service registers and aimed to be inclusive and as representative of the UK population as possible. The assessment included subjective questions concerning hearing and tinnitus. Neuroticism was self-rated on 13 questions from the Eysenck Personality Inventory. Associations between neuroticism and tinnitus were tested with logistic regression analyses.

Results: Prevalence of tinnitus was significantly higher for males, and increased with age, doubling between the youngest and oldest age groups (males 13% and 26%; females 9% and 19% respectively). Of those with tinnitus, females were more likely to report bothersome tinnitus. Neuroticism was associated with current tinnitus and bothersome tinnitus, with the items: 'loneliness', 'mood swings', 'worrier/anxious' and 'miserableness', as the strongest associations of bothersome tinnitus.

Conclusions: Neuroticism was identified as a novel association with tinnitus. Individuals with tinnitus and higher levels of neuroticism are more likely to experience bothersome tinnitus, possibly as a reflection of greater sensitivity to intrusive experiences.

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Introduction

Tinnitus is the perception of sounds in the head or ears, usually defined as a ringing, buzzing or whistling sound. Tinnitus can be objective

or subjective. Objective tinnitus is caused by sounds generated by an internal biological activity. However, subjective tinnitus is much more common and results from abnormal neural activities which are not formed by sounds [1]. Subjective tinnitus is a common and disturbing phenomenon, with a reported prevalence ranging from 7 to 20% [2–5] in the general population, and an estimated 10 year incidence rate in adults aged over 48 years of 13% [6]. Approximately 5% of the population is severely affected by their tinnitus [7], for example experiencing sleep disorders, concentration difficulties, and symptoms of anxiety and depression.

Tinnitus can affect a person's satisfaction with quality of life [8], and their physical, emotional, and social functioning [9], as well as leading to a higher incidence of anxiety and depression [10]. However, not everyone with tinnitus will experience the same amount of distress and impairment of quality of life. It is likely that psychological factors – including

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personality characteristics – mediate the impact of tinnitus. Personality type can influence the vulnerability to, and the severity of, the problem by influencing the tendency to be aware of it [11].

Personality characteristics previously reported to be associated with tinnitus include hysteria and hypochondriasis [9,12], introversion [13], withdrawal [9], and emotional isolation [14]. Additionally, particular cognitive strategies, for example, dysfunctional and catastrophic thoughts can increase patients' emotional distress and perceived tinnitus severity, and are thought to be closely related to personality factors [15]. Neuroticism is expressed as “individual differences in the tendency to experience negative, distressing emotions” [16] (p. 301). At one extreme, individuals are characterized by high levels of vulnerability to experience negative emotions, including sadness, fear, anxiety, anger, frustration, and insecurity [17]. At the other end of the spectrum, individuals who score low in neuroticism are more emotionally stable and less reactive to stress. Neuroticism has been associated with adverse outcomes in various health conditions, including increased likelihood of morbidity in those with testicular cancer [18], and an increased likelihood of arthritis, kidney/liver disease, and diabetes in the general population [19]. There is evidence that neurotic traits are stronger in tinnitus patients [20], particularly in those with higher levels of tinnitus annoyance, and recent evidence that neuroticism may predict the development of severe tinnitus in patients already experiencing some tinnitus [21]. In a cross-sectional sample of 530 participants (50% with chronic tinnitus), Bartels and colleagues [22] studied the role of type D personality (the tendency towards negative affectivity and social inhibition) on health-related quality of life and self-reported tinnitus-related distress. Tinnitus patients with type D personality reported greater tinnitus-related distress and poorer health-related quality of life compared to those with other personality types. The authors concluded that some personality characteristics are associated with having tinnitus and are likely to contribute to its perceived severity.

UK prevalence estimates for tinnitus are relatively dated; data for the widely cited National Study of Hearing (NSH) [2] were collected in the 1980's. It is possible that prevalence figures may have changed since then, for example, due to more recreational noise exposure. In addition, neither the NSH nor any other large-scale, population-based study has provided comparisons between tinnitus and neuroticism. The objectives of this study were to provide a detailed description of the prevalence of tinnitus in a large population study of UK adults aged 40 to 69 years, according to age and sex, (following on from a previous study [5]), as well as to examine the link between tinnitus severity and neuroticism.

Methods

The UK Biobank is a large dataset which was established as a resource for the investigation of the genetic, environmental and lifestyle causes of common diseases [23]. It provides an excellent opportunity to study a range of factors associated with hearing-related problems, including tinnitus. Recruitment of adults aged 40 to 69 years was carried out through National Health Service registers and aimed to be inclusive and as representative as possible of the UK population. Overall, 9.2 million invitations were sent out and 503,325 participants were recruited over the course of 2006–2010, giving a response rate of 5.47%. It is possible that the low response rate may have led to unknown biases; however, due to the size and coverage of the sample, UK Biobank suggests that associations observed in the sample should be generalizable to the UK population [23]. Participants completed a single assessment of approximately 90 minute duration at one of the 22 assessment centres located in England, Scotland, and Wales. The UK Biobank self-completed touch-screen questionnaire included data relating to a broad range of health-related issues, including hearing, lifestyle, occupation, family history, and psychological state. The present study reports data related to tinnitus and personality.

Demographic questions

Demographic data were collected during the assessment, including age, sex and socioeconomic status. The Townsend deprivation score was used in UK Biobank as a proxy for socioeconomic status. This is a geographic based measure where census data are available and were used as a measure of deprivation using the 2001 census returns.

Tinnitus

Two self-report questions on tinnitus were included in the touchscreen questionnaire, answered by 172,621 participants. The first question was “Do you get or have you had noises (such as ringing or buzzing) in your head or in one or both ears that lasts for more than five minutes at a time?” Participants who gave a yes response were then asked to categorise the duration from a predefined list. Current tinnitus was identified if the participant responded: ‘Yes, now most or all of the time’, ‘Yes, now a lot of the time’ or ‘Yes, now some of the time’. The second question was concerned with severity of tinnitus: “How much do these noises worry, annoy or upset you when they are at their worst?” The response options were ‘not at all’, ‘slightly’, ‘moderately’, or ‘severely’. Bothering tinnitus was defined as those who responded ‘severely’ or ‘moderately’. Participants could also respond ‘do not know’ or ‘prefer not to answer’ to these questions. The UK Biobank assessment protocol did not include any tinnitus scale, nor did it measure the loudness of the tinnitus, however the subjective questions included have been deemed reliable in similar studies [2].

Hearing difficulty

Participants (n = 497,984) were asked “Do you have any difficulty with your hearing?” Participants could respond ‘yes’, ‘no’, or ‘I am completely deaf’. Those that responded ‘I am completely deaf’ were excluded from answering subsequent hearing-related questions. A second question asked: “Do you find it difficult to follow a conversation if there is background noise (such as TV, radio, children playing)?” Again, participants could respond ‘yes’, or ‘no’.

Neuroticism

The Eysenck Personality Inventory (EPI) [24] is a questionnaire assessing personality type. Eysenck describes personality according to three biologically-based independent dimensions of temperament measured on a continuum: extraversion/introversion, neuroticism/stability and psychoticism/socialisation. Of these, the thirteen questions related to neuroticism/stability were included in UK Biobank (see Table 1). A total of 501,776 participants responded to these questions. The response options were: ‘yes’, ‘no’, ‘do not know’, ‘prefer not to answer’. These

Table 1
Neuroticism subscale from the EPI [23].

Description	Question
Mood swings	Does your mood often go up and down?
Miserableness	Do you ever feel 'just miserable' for no reason?
Irritability	Are you an irritable person?
Sensitivity/hurt feelings	Are your feelings easily hurt?
Fed-up feelings	Do you often feel 'fed-up'?
Nervous feelings	Would you call yourself a nervous person?
Worrier/anxious feelings	Are you a worrier?
Tense/highly strung	Would you call yourself tense or 'highly strung'?
Worry too long after embarrassment	Do you worry too long after an embarrassing experience?
Suffer from nerves	Do you suffer from 'nerves'?
Loneliness/isolation	Do you often feel lonely?
Guilty feelings	Are you often troubled by feelings of guilt?
Risk taking	Would you describe yourself as someone who takes risks?

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