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Review Article

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Neuroticism Research: A Narrative Review

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ABSTRACT

This narrative review of the current literature on neuroticism is a summary of research published in 2024-2025. Several negative psychological effects have been noted for neuroticism including poor relationship quality, dream anxiety, excessive social media use, social aggression, stuttering, panic disorder, substance misuse, suicidality and dementia. Negative physical effects have also resulted from neuroticism including odor memory, gastrointestinal disturbance, cardiovascular disease, small vessel disease, aneurysms, frailty and as many as 37 overlapping diseases. Risk factors/predictors for neuroticism have also appeared in this current literature including emotional abuse, worry and rumination, depression and gastrointestinal microbiome composition. A few buffers or protective factors for the negative effects of neuroticism include self-compassion, mindfulness, quality sleep, Mediterranean diet and physical activity. Potential underlying biological mechanisms that have been the focus of research in the current literature on neuroticism include cytokines, activation in the default mode network, activity in the amygdala, less gray matter and more white matter in different regions of the brain, and heritability. Methodological limitations include the absence of bi-directionality analyses for many of the variables that are seemingly reciprocal with neuroticism and the absence of intervention studies.

Neuroticism has been defined as a personality trait characterized by a **chronic tendency to experience negative emotions** including anxiety, depression, anger and emotional instability. Neuroticism is heavily influenced by genetics and is a vulnerability factor for mental health problems. Its **prevalence** is approximately 30 to 40% in the US and its **heritability** has been given at 40 to 50% [1]. The primary symptoms of neuroticism are **worry, mood swings, self-criticism, avoidance and impulsivity.** The avoidance and impulsivity symptoms are likely the most negative because they would have more effect on others than the internalized symptoms of worry, mood swings and self-criticism. Neuroticism has typically been measured by the Big Five Personality Inventory.

This narrative review of the current literature on neuroticism is a summary of research published in 2024 and 2025. The papers were found on PubMed and PsycINFO by entering the terms neuroticism and the years 2024 and 2025. Thirty-four papers are reviewed here including papers on negative psychological and physical effects (17 papers), papers on risk factors/predictors (5 papers), on buffers for neuroticism (5 papers) and potential underlying biological mechanisms (7 papers). That the number of negative effects papers is equivalent to all the others combined reflects this highly negative literature. The papers are accordingly grouped into sections on effects, risks, buffers and mechanisms. These sections are followed by a discussion of methodological limitations of this literature.

Negative Psychological Effects

Several (10) negative psychological effects have been the focus of this current literature on neuroticism (see table 1). The negative psychological effects include poor relationship quality, dream anxiety, excessive social media use, social aggression, stuttering, panic disorder, substance misuse, suicidality and dementia. Although these are likely inter-related problems, they have been primarily studied as single variables.

Table 1: Negative psychological effects of neuroticism (and first authors)

Effects	First Authors
Poor relationship quality	Esplin
Nightmare distress	Wang
Excessive internet use	Gugushrili
Social aggression	Quan
Stuttering	Palomo
Panic	Faur, He
Substance misuse	Davies
Suicidality	Lee

In a meta-analysis on 148 studies, neuroticism and **relationship quality** were associated variables [2]. The negative correlation between neuroticism and relationship quality was surprisingly significant for that many studies (148).

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In a paper entitled "Neuroticism affects nightmare distress through rumination", the results are in the title [3]. In this sample of university students (N= 758), neuroticism led to **dream anxiety with rumination as a mediator.** Typically, mediating variables selected by researchers become significant mediators as their selection is usually based on theory as in rumination leading to dream anxiety. Rumination would likely also contribute to other sleep problems like delayed sleep onset and negative sleep quality which could be moderating or mediating variables for a more complex mediating/moderator analysis or structural equation modeling.

Neuroticism has also been associated with **excessive internet use.** In a study entitled "The association between neuroticism and problematic social networking site uses: the role of fear of missing out and self-control", the fear of missing out (FOMO) led to problematic social networking use (N = 151) [4]. Again, the mediating FOMO variable is not surprising as being connected and FOMO are primary motives for being on social media.

Neuroticism has also been related to **social aggression** [5]. In this sample of college students (N=942), x social aggression with depression as a mediator and social support as a moderator. That depression was a mediator is not surprising as depression has led to aggression in many studies.

Neuroticism has also led to developmental **stuttering** in a small sample study (N=13 with stuttering and 13 without stuttering) [6]. In this sample, anticipation of stuttering was a moderator variable that exacerbated the stuttering. The contribution of anticipation of stuttering to the variance in stuttering was not assessed.

Neuroticism has also contributed to **panic** in a sample of students (N= 373) [7]. The relationship between neuroticism and panic was mediated by **anxiety sensitivity.** Panic has been considered a more extreme form of anxiety, suggesting that anxiety sensitivity would lead to anxiety and, in turn, to panic if the anxiety sensitivity and anxiety were excessive. Anxiety sensitivity may have been considered a proxy for anxiety by this research group.

Neuroticism has also had a mediating role in several studies. For example, neuroticism was a mediator in a study entitled "The mediating role of neuroticism and anxiety sensitivity in the relationship between childhood trauma and panic disorder severity" [8]. In this sample, **anxiety sensitivity** was once again a mediator (N= 84 with panic disorder and 112 age and gender matched controls). These cross-sectional data, like the data from most of the neuroticism studies, has the problem of recall bias, especially when retroactively reporting childhood trauma. Unfortunately, childhood trauma is not typically reported by children or their families at the time that it occurs. This study is limited by these cross-sectional rather than longitudinal data, as are most studies in this literature on neuroticism.

In research entitled "The roles of extraversion and neuroticism in the relationship between childhood adversity and adolescent substance misuse", the results are given in the title [9]. Both extraversion and neuroticism in adulthood mediated the relationship between childhood adversity and adolescent **substance misuse.** That extraversion and neuroticism were both mediators were surprising given that extraversion is typically viewed as a positive personality quality and neuroticism as negative. Neuroticism may have been a stronger mediator.

Neuroticism has also mediated the association between traumatic events and **suicidality** [10]. In this sample from the UK Biobank (N= 111,931), depressive symptoms were also a mediator. These data by virtue of their large sample size are compelling. They are not; however, surprising as traumatic events and neuroticism have been independently associated with suicidality, and their combination would be expected to predict suicidality.

Negative Physical Effects

Several negative physical effects have also resulted from neuroticism (see table 2). They include odor memory, gastrointestinal disturbance, cardiovascular disease, small vessel disease, aneurysms, frailty and as many as 37 overlapping diseases.

Table 2: Negative physical effects of neuroticism (and first authors)

Effects	First Authors
Odor memory	Sabiniewicz
Gastrointestinal disease	Tian
Cardiovascular disease	Zhang
Cerebral small vessel disease	Zhao
Aortic aneurysm	Wang
Frailty	Xing
37 non-overlapping diseases	Huang

Neuroticism has been related to **odor memory** but only in women [11]. The greater odor memory in women may relate to their generally greater sense of smell than men as they often outperform them in odor detection, discrimination and identification studies. Data have also indicated that women have up to 50% more neurons and glial cells in the brain's olfactory bulbs. The increased sensitivity has also been related to hormonal differences. Women in this sample had more neuroticism than men which was also not surprising because women generally score higher on neuroticism scales across cultures and demographics.

Genetic links have also been established between neuroticism and **gastrointestinal disease** [12]. In this large sample (N= 390,278), genetic links were noted for six gastrointestinal diseases. Genetic liability to neuroticism was associated with increased risks of irritable bowel syndrome, peptic ulcer disease and gastroesophageal reflux disease.

In a study entitled "Associations between specific neuroticism symptoms and **cardiovascular disease:** insights from genetic analysis", a large sample from the UK Biobank(N=380,506) was used for a genetic analysis [13]. Neuroticism was causally associated specifically with increased risk of ischemic stroke and myocardial infarction.

Neuroticism has also been associated with **cerebral small vessel disease** based on a genetic correlation [14]. The depression and worry factors of neuroticism were associated with the cerebral small vessel disease.

The cerebral small vessel disease may contribute to the risk of aortic aneurysm. In a study entitled "Causal association between neuroticism and risk of aortic aneurysm", the results are given in the title [15]. In this large sample from the UK Biobank (N=479,194), individuals with genetically predicted neuroticism had the risk of **aortic aneurysm.**

Frailty is still another negative physical effect of neuroticism. In a study entitled "Exploring the bi- directional causality between neuroticism and frailty", the results are in the title [16]. This bidirectional causality was based on a large UK Biobank data set (N= 489,212) [16]. Surprisingly, this is one of the only studies that has addressed the bidirectionality of variables.

Neuroticism is associated with several diseases based on another large UK Biobank dataset (N= 463,916) [17]. In this database, neuroticism was associated with **37 non-overlapping diseases** including increased risk of infection, cardiometabolic, neuropsychiatric, digestive, and respiratory disease. Surprisingly, despite all these diseases there was a decreased risk of cancer and less risk of all-cause mortality. In this database depressed affect was highly correlated with greater volume in the amygdala and less insula volume. A protective factor was sensitivity to environmental stress and sensitivity in general which likely led to the avoidance of stressful situations.

Risk Factors/Predictors

Several risk factors/predictors for neuroticism have also appeared in this current literature (see table 3). They include emotional abuse, worry and rumination, depression and gastrointestinal microbiome problems.

Table 3: Risk factors/predictors of neuroticism (and first authors)

Risk factors / Predictors	First Authors
Childhood emotional abuse	Verrastro, Zhao
Worry and rumination	Diehl
Brooding	Vasupanrajit
Gut microbiome composition	Yang

In a study entitled "Childhood emotional abuse, neuroticism, perfectionism and workaholism in an Italian sample of young workers", the results are in the title [18]. In this study (N =1176), gender invariance was reported for this complex model of **childhood emotional abuse** and neuroticism.

Another research group has reported longitudinal associations between childhood victimization and neuroticism from middle childhood to early adolescence in a sample from China (N=4315) [14]. In this sample, **peer victimization** predicted neuroticism more frequently in girls and **family abuse** predicted neuroticism more frequently in boys. These gender differences are inconsistent with the previously described data that suggested gender invariance of the relationship between childhood abuse and neuroticism [18]. These differences in findings may relate to the age differences in the samples and the different types of abuse.

Worry and rumination have been associated with neuroticism [1]. Interestingly, in this sample (N= 309), while worry and rumination were associated with more neuroticism, mind wandering was associated with less neuroticism. Mind wandering is typically viewed as more pleasant than worry and rumination.

Brooding has similarly been considered a risk factor for neuroticism and depression [19]. In this sample of both depressed (N= 74) and healthy (N=44) individuals, brooding and neuroticism were strongly interrelated manifestations of depression.

In a study entitled "Identifying and ranking causal association between microbiota and neuroticism, the results are in the title [20]. Causal relations were noted between **gut microbiome composition** and neuroticism.

Buffers for Negative Effects of Neuroticism

A few buffers or protective factors for the negative effects of neuroticism have been addressed in this literature (see table 4). They include self-compassion, mindfulness, Mediterranean diet, physical activity and sleep quality.

Table 4: Buffers for negative effects of neuroticism (and first authors)

Buffers	First Authors
Self-compassion	Wang
Sleep quality	Xiaopeng
Mindfulness	Xiaopeng
Mediterranean diet	Sorli
Physical activity	Gao

In a paper entitled "Self – compassion moderates the relationship between neuroticism and depression in junior high school students; **self-compassion** lessened the relationship between neuroticism and depression [21]. In this sample (N= 757), junior high school students were already noted to experience neuroticism and depression, but that relationship was less apparent in those who reported self-compassion.

In a paper entitled "Sleep quality and mindfulness mediate the relationship between neuroticism and subjective well-being in early adolescents", both quality sleep and mindfulness were buffers [22]. In this study (N=1110), because mediation analysis was conducted, it's not clear the relative degree to which **quality sleep and mindfulness** contributed to subjective well-being. Mediation implies a causal pathway, but the strength or direction of the relationship between the independent and dependent variables cannot be determined. A regression analysis or structural equation modeling of these data may have been more informative.

A **Mediterranean diet** has been a protective factor for neuroticism in an older adult sample (55–75 years-old) [23]. In this gene- diet interaction study, neuroticism was inversely related to adherence to a Mediterranean diet. Lack of adherence increased neuroticism while adherence to the diet decreased neuroticism.

Neuroticism has been negatively related to **physical activity** in a metanalysis of 25 studies [24]. In this meta-analysis, a bidirectional relationship was noted with more neuroticism resulting from less activity and more physical activity leading to less neuroticism.

Potential Underlying Biological Mechanisms for Neuroticism

Some potential underlying biological mechanisms have been the focus of research in the current literature on neuroticism (see table 5). The contribution of this risk factor was not determined. They include activation of cytokine profiles, activation of the default mode network, activity in the amygdala, less gray matter in different regions of the brain, more white matter in various brain regions and heritability.

Table 5: Potential underlying biological mechanisms for neuroticism (and first authors)

Mechanisms	First Authors
Activation of cytokine profiles	Maes
Activation of ventral default mode network	Zhi
↑ Gray matter in frontal and limbic regions	Gao
↑ White matter in thalamus	Gao
↑ Amygdala volume and ↓ Insula volume	Huang
↓ Gray matter volume	Gao
↑ White matter hyperintensities	Terracciano
6 genes	Hong

Activation of cytokine profiles has been implicated as a potential underlying mechanism for neuroticism [25]. In this sample of those with major depression (N= 66) and healthy controls (N= 65), lower levels of IL–10 (a potent anti-inflammatory) and activated cytokine profiles with neurotoxic potential were related to neuroticism.

In an fMRI study (N= 223), neuroticism was associated with **activation of the ventral default mode network** which serves affective cognition [26].

In a study entitled "Associations between neuroticism and brain–wide structural outcomes", a UK Biobank database was analyzed (N= 36,901) [27]. **More gray matter volume** was noted in the frontal and limbic regions and **more white matter** in the thalamus. A genetic analysis suggested that hypertension and both gray and white matter mediated neuroticism.

In another study based on a UK Biobank database (N= 463,916) depressed affect, which is the leading neuroticism cluster, was correlated with **greater amygdala volume and less insula volume** [17].

Mixed findings have been noted in this literature for gray matter volume (responsible for processing information, controlling muscle movement and regulating sensory perception) and white matter volume (responsible for cognitive speed and memory). **Less gray matter volume** was associated with neuroticism in a neuroimaging study on a large sample (N= 39,459) [28]. In a study entitled "Neuroticism and white matter intensities", a UK Biobank sample was analyzed for older adults (N= 40,002 adults age 45 to 82) [29]. In this sample, neuroticism was related to **greater white matter** hyperintensities.

Finally, genetic underpinnings have been noted for neuroticism. In a study entitled "Developing the genetic underpinnings of neuroticism" (N=4473 druggable genes), **6 genes** were noted to be promising therapeutic targets for neuroticism [30]. Six genes, however, are a very small proportion of the 4473 genes analyzed.

Methodological Limitations of this Literature

Several methodological limitations can be noted for this current literature on neuroticism. They include sampling problems, the lack of bidirectional data considerations, inconsistent findings and no intervention studies.

Surprisingly, only one old adult study was found in this literature. Although many studies featured variables that seemed to be reciprocal, only one study addressed bidirectionality. Typically, mediation /moderation analyses were conducted. The relative contributions of the variables are difficult to determine in those analyses. Regression analysis and structural equation modeling might have been more informative.

Several inconsistencies were noted in this literature. Those included some studies that suggested gender invariance and others that suggested gender differences. And inconsistency was also noted in the gray and white matter findings in the fMRI studies. Surprisingly, potential underlying mechanism studies were limited and no intervention studies could be found despite the severity of the negative effects of neuroticism. Despite these methodological limitations, the findings noted here will inform future research on the negative effects of neuroticism and preventive interventions to reduce neuroticism.

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