



Neuroticism and sleep-onset: What is the long-term connection?

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ABSTRACT

People with sleep-onset problems often experience neuroticism. To what extent the one problem leads to the other is unknown. We used self-reported data from a Swedish longitudinal project to examine developmental links between neuroticism and sleep-onset problems. A sample of 212 people, followed from birth to midlife, was part of a cohort study spanning 37 years. Adolescent neuroticism was measured at age 16 with the High School Personality Questionnaire (HSPQ, Form A) and in midlife at age 37 with the Eysenck Personality Questionnaire (EPQ). Sleep-onset problems were measured at ages 15 to 17, 25, and 37 with items developed for the Solna Project. Adolescent neuroticism failed to predict sleep-onset problems. Instead, sleep-onset problems in adolescence and young adulthood predicted midlife neuroticism. We found that sleep-onset problems during adolescence were a direct risk for midlife neuroticism, as well as, an indirect risk through continuance of sleep-onset problems into adulthood. This study provides longitudinal support for adolescent sleep-onset problems as a potent risk factor for heightened neuroticism in midlife.

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1. Introduction

Some people with sleep-onset problems experience symptoms resembling neuroticism. Neuroticism, also known as negative affectivity or trait anxiety (Watson & Clark, 1984), is a genetically and environmentally influenced personality trait (McCrae, Jang, Livesley, Riemann, & Angleitner, 2001; Vernon, Jang, Harris, & McCarthy, 1997). Traits predispose people to perceive and experience their environment in characteristic ways (Buss & Plomin, 1984). As such, neuroticism is a tendency toward negative emotions, cognitions, and behaviours (Jang, McCrae, Angleitner, Riemann, & Livesley, 1998; Watson, Clark, & Harkness, 1994). Likewise, sleep-onset problems have emotional (e.g., Dahl & Lewin, 2002), cognitive (e.g., Roth, 2007), and behavioural components (e.g., Perlis, Giles, Mendelson, Bootzin, & Wyatt, 1997). Similarities suggest that one problem may be important for the other.

Theoretically, processes involved in the development of insomnia, especially sleep-onset problems, are hierarchical. These are predisposing conditions, precipitating circumstances, and perpetuating factors (e.g., Drake & Roth, 2006). Processes may include biological (e.g., Espie, 2002) and genetic (Watson & Goldberg, 2006) predisposition; stressful life-event precipitation (Vahtera et al., 2007); and physiological (e.g., Perlis et al., 1997), cognitive (e.g.,

Harvey, 2002), and behavioural (e.g., Perlis et al., 1997) perpetuation. Potentially the association occurs on all levels.

Perhaps neuroticism predisposes some people to react toward life-stressors with negative emotions, cognitions, and behaviours incompatible with falling asleep. Predisposition alone is likely insufficient for developing sleep-onset problems (e.g., Drake & Roth, 2006). Instead, life-stressors may aggravate neuroticism, thus contributing to sleep-onset problems. On the other hand sleep-onset problems may heighten neuroticism. Typical ways people with sleep-onset problems feel, think, and react is like that for neuroticism (e.g., Dorsey & Bootzin, 1997; Freedman & Sattler, 1982; Shealy, Lowe, & Ritzler, 1980; Vahtera et al., 2007). Unknown is the nature of the association.

Indeed, sleep-onset problems are associated with neuroticism. College students with sleep-onset problems reported higher neuroticism compared to controls (Shealy et al., 1980). In a laboratory, university students subjectively experiencing sleep-onset problems, reported more neuroticism than students with objective sleep-onset problems (Dorsey & Bootzin, 1997). The direction of the relation is unclear.

The few studies about neuroticism and sleep-onset are cross-sectional or retrospective. Which problem precedes or precipitates the other cannot be determined with these methods. Retrospective reports have the added disadvantage of memory distortion. Neuroticism may result in sleep-onset problems, or sleep-onset problems may spur emotional instability. Only longitudinally can the long-term relation be determined.

Our aim is to examine developmental associations between these two problems. The longitudinal design enables us to examine

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the long-term relation between neuroticism and sleep-onset problems. Specifically, is neuroticism predictive of sleep-onset problems or vice versa? To our knowledge, this is the first study to examine the long-term connection between neuroticism and sleep-onset problems.

2. Method

2.1. Participants

Data were from a birth to midlife cohort project at the Clinic for the Study of Children's Development and Health at Karolinska Hospital in Stockholm, Sweden. The study began 1955 in Solna, a suburb of Stockholm. Most pregnant women in Sweden receive prenatal care. Researchers asked every fourth pregnant woman registered for prenatal care to participate in a long-term paediatric study. The resulting sample was 212 children, 122 (58%) boys and 90 (42%) girls. The sample was shown through comparisons of socio-economic factors, parental age, maternal civil status, birth order, gestational age, and weight, in addition to registered criminality to be representative of Swedish children (Karlberg et al., 1968; Stattin & Klackenborg-Larsson, 1990).

The present study included 185 participants, 107 (58%) men, 78 (42%) women. This was 91% of the original sample still alive age 37. Forty-five percent were married, 31% cohabitating, and 16% had a romantic relationship. On average, partners had been living together 10 years. Non-cohabitating romantic relationships averaged 3.5 years. Seventy-eight percent of participants had children. Thirty-eight percent of participants, and 35% of their partners held a university degree.

2.2. Procedure

Researchers tracked participants' somatic, psychological, and social development through medical examinations, interviews, and inventories (Karlberg et al., 1976). Participants were examined six times the first year, twice the second, and annually thereafter until age 18. Researchers tested participants as closely as possible to the given ages to control for differences in chronological age, usually within ± 14 days. Additional data collections occurred when participants were 21, 25 and 37.

2.3. Material

2.3.1. Neuroticism measures

2.3.1.1. Adolescence. At age 16, the High School Personality Questionnaire (HSPQ, Form A, Second Edition, Cattell, 1962) was administered. In another study, a principal components analysis was conducted with a varimax rotation of the original HSPQ model (Ormerod & Billing, 1982). This was to address criticism of how many factors to include in Cattell's 16 Personality Factor Model. We used the resulting 6 orthogonal factor model adapted from the HSPQ. The neuroticism measure comprises 14-items from three of four subscales from the anxiety/neuroticism factor. The three subscales used were *emotionally stable* (emotionally less stable, easily upset), *tense* (frustrated, overwrought), *excitable* (impatient, overactive). The three-item subscale, *controlled*, was excluded from the neuroticism scale due to its inclusion in the expedient/conscientious controlled factor (see Möller, 2004). Examples of remaining questions are "When you do a foolish thing, do you feel so badly that you wish the earth would just swallow you up?" ($a = \text{yes}$, $b = \text{perhaps}$, $c = \text{no}$), "Do small troubles sometimes 'get on your nerves' even though you know that they are not very important?" ($a = \text{yes}$, $b = \text{perhaps}$, $c = \text{no}$), "If your friends leave you out of something they are doing, do you ($a = \text{think they$

made a mistake , $b = \text{in between}$, $c = \text{feel hurt and angry}$)?", "When something important is coming up, such as a test or a big game, do you ($a = \text{stay very calm and relaxed}$, $b = \text{in between}$, $c = \text{get very tense and worried}$)?", "Do you sometimes feel happy and sometimes depressed without real reason?" ($a = \text{yes}$, $b = \text{uncertain}$, $c = \text{no}$). Alpha reliability was .79.

2.3.1.2. Midlife. At age 37, participants completed Eysenck's Personality Questionnaire (EPQ, Eysenck & Eysenck, 1975). We used the 23-item neuroticism scale. Higher scores equate with higher neuroticism. Examples were "After the fact, do you often worry about what you should not have done, or said?", "Are you easily irritated?", "Are your feelings easily hurt, or offended?", "Do you often experience torment from guilt feelings?", and "Do you consider yourself a nervous person?" ($0 = \text{no}$, $1 = \text{yes}$). Alpha reliability was .87.

2.3.2. Sleep-onset problems

Measures of sleep-onset problems were from self-report questionnaires developed for the Solna Project (Karlberg et al., 1968). Parent reports from ages 6 to 16 are reported here to establish stability. Parent-reported childhood sleep-onset problems were stable year-to-year from ages 6 to 16 (average $r = .56$, $p < .001$). Self-reported sleep-onset problems ages 15–17 showed year-to-year stability (average $r = .44$, $p < .001$) and corresponded with parent-reported sleep-onset problems ages 15–16 ($r = .47$, $p < .001$). Self-reported sleep-onset problems ages 15–17 corresponded with those at ages 25 ($r = .42$, $p < .001$) and 37 ($r = .31$, $p < .001$). Self-reported sleep-onset problems at age 25 were related to continued problems at age 37 ($r = .30$, $p < .001$). Parents and their offspring report participant sleep-onset problems as stable from childhood through midlife.

2.3.2.1. Adolescence. The average score of the three annual responses to one-item, ages 15–17, formed a scale of adolescent sleep-onset problems: "Do you have difficulty falling asleep?" ($1 = \text{no}$, $2 = \text{seldom}$; *under certain circumstances*, $3 = \text{occasionally}$, $4 = \text{yes}$, *previously this year but not anymore*, $5 = \text{yes}$, *often*). The fourth scale anchor is uneven. Analyses conducted with and without the fourth scale anchor provided identical results. We retained the fourth scale anchor in the analyses to maintain population size. Reliability was .62, acceptable given the one-year intervals.

2.3.2.2. Young adulthood. One-item measured sleep-onset problems at age 25 (Karlberg et al., 1968). "Do you have difficulty falling asleep?" ($1 = \text{no}$, $2 = \text{seldom}$; *under certain circumstances*, $3 = \text{occasionally}$, $4 = \text{yes}$, *previously this year but not anymore*, $5 = \text{yes}$, *often*). See sleep-onset problems ages 15–17 for notes regarding scale anchors.

2.3.2.3. Midlife. At age 37, we averaged two-items as a measure of sleep-onset problems. The first was "Do you have difficulty falling asleep?" ($1 = \text{no}$, $2 = \text{seldom}$; *under certain circumstances*, $3 = \text{occasionally}$ (*up to once a month*), $4 = \text{sometimes}$ (*more than once a month to once a week*), $5 = \text{often}$ (*more than once a week*), $6 = \text{almost every night}$). The second was a broad measure of sleeping problems "Have you had difficulty sleeping within the last 3 months (difficulty falling asleep, waking during the night, poor sleep)?" ($1 = \text{no}$, $2 = \text{once}$, $3 = \text{once a month}$, $4 = \text{once a week}$, $5 = \text{several times per week}$, $6 = \text{almost every day}$). The midlife sleep-onset measure corresponded with other sleep measures at age 37: sleep medication usage last year ($r = .24$, $p < .001$), and last 10 years ($r = .27$, $p < .001$); getting enough sleep ($r = .19$, $p < .05$); sleep duration ($r = .18$, $p < .05$); waking refreshed and rested ($r = .33$, $p < .001$); and sleep maintenance ($r = .32$, $p < .001$). This demonstrates measure construct validity. Comparisons of analyses with

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