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Received: 26 October 2023 | Accepted: 20 February 2024

DOI: 10.1002/pmh.1611

RESEARCH ARTICLE

Personality and Mental Health

The roles of extraversion and neuroticism in the relationship between childhood adversity and adolescent substance misuse

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Funding information
The Christchurch Health and Development Study is funded by a programme grant from the Health Research Council of New Zealand (16/600).

Abstract

Although the influences of extraversion and neuroticism on the relationship between childhood adversity and substance misuse have been considered in adults, they are not yet clear and have not been examined among adolescent samples. This study sought to investigate the relationship between childhood adversity and adolescent substance misuse, alongside the influences of extraversion and neuroticism, using data from a longitudinal birth cohort study. Statistical analyses were performed on a longitudinal dataset provided by the Christchurch Health and Development Study (CHDS). After controlling for confounds, childhood adversity was a significant predictor of substance use disorder symptoms in adolescence. Moderation analyses showed that experiences of childhood adversity were most strongly associated with adolescent substance use disorder symptoms at higher levels of extraversion and at higher levels of neuroticism. Among adolescents who have experienced childhood adversity, extraversion and neuroticism may be risk factors for substance use disorder. By encouraging professionals to target adolescent substance misuse intervention and prevention approaches towards those who have experienced childhood adversity and are high in extraversion and/or neuroticism, these findings may help to diminish the prevalence of adolescent substance misuse and improve the health of adolescents.

INTRODUCTION

Adolescent substance misuse is a global health concern (Nawi et al., 2021) that warrants academic attention. In the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), substance use disorder symptoms, used interchangeably with the term 'substance misuse', are composed of hazardous use, social and interpersonal problems related to use and/or the neglect of responsibilities due to the use of substances (American Psychiatric Association DSMTF, 2013). Generally considered to span the ages of 12–18 years old (Jaworska & MacQueen, 2015), the adolescent period is accompanied by various neurological, biological and social changes that situate individuals at a heightened vulnerability for adverse outcomes after substance misuse. Research suggests that the earlier the onset of substance misuse, the greater the risk of lifetime substance dependence and adverse psychosocial outcomes (Jordan & Andersen, 2017). Neurotoxins such as cannabis and alcohol may interrupt neuromaturation

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processes and exacerbate an intrinsic vulnerability to substance dependence (Squeglia et al., 2009). Additionally, rapid development of the brain's prefrontal regions during this age results in increased responsiveness to reward (Spear, 2013). This may augment an adolescent's tendency to seek out novel stimuli and may predict not only the initiation of substance use but also the transition to substance misuse and an increased propensity to relapse (Wingo et al., 2016).

Alcohol and cannabis are two of the substances most associated with misuse during adolescence (Thoma et al., 2011). At this age, heavy alcohol consumption has been shown to reduce attention and executive functioning, predispose individuals to mental health and neurocognitive problems that may continue into adulthood (Thoma et al., 2011) and increase the risk of adverse outcomes through dangerous behaviours such as violence, sexual risk taking, crime and motor vehicle collisions (Boden & Fergusson, 2011). Cannabis use in adolescence is associated with declines in cognitive processing, memory impairment, an increased likelihood of risky behaviours and an increased risk among those with a genetic predisposition to developing a psychotic disorder (Volkow et al., 2016). Understanding the factors that influence the risk of adolescent substance misuse is therefore vital when attempting to improve outcomes among this age group.

Childhood adversity

Childhood adversity experiences, including any form of physical and emotional abuse, exploitation or neglect that risks harm towards a child (Butchart et al., 2008), are associated with an increased vulnerability to the development of substance misuse. Childhood adversity is distinguishable from childhood trauma. Trauma is the experience of strong negative emotions after an adverse event is perceived as harmful, threatening or highly frightening (Pearce et al., 2019). Perceptions of such events and, therefore, their subsequent emotions differ across individuals (Pearce et al., 2019). Consequently, childhood trauma may be conceptualised as one possible outcome of exposure to childhood adversity.

More severe and frequent childhood adversity experiences have been associated with an earlier age of onset of substance use disorder symptoms and an earlier age of first substance use (Ruggiero et al., 1999). Additionally, exposure to multiple adverse childhood experiences has been linked with an increased risk for severe substance use disorders in adolescence (Gomez et al., 2018). This relationship appears to persist outside of adolescence, as individuals with two or more childhood adversity experiences exhibit a greater risk for lifetime alcohol dependence (Pilowsky et al., 2009).

Personality

Dimensional personality traits may influence substance misuse in adulthood. Extraversion, a trait characterised by high levels of excitement, positive affect and sociability (Mesurado et al., 2014), has been related to an increased tendency towards substance use but a decreased risk for substance misuse and dependence. Although extraverted adults tend to demonstrate tolerant attitudes towards substance use (Atherton et al., 2014), these attitudes exist only when regarding recreational substance use as opposed to misuse (Mesurado et al., 2014). Therefore, after adverse childhood experiences, individuals high in extraversion may be at a decreased risk for substance abuse when compared with individuals lower in extraversion.

Neuroticism, a dispositional trait involving excessive worry, emotional instability and poor responses to environmental stress (Widiger & Oltmanns, 2017), has been associated with an increased likelihood of substance misuse among emerging adults (Rogers et al., 2018). In studies examining the personality profiles of drug users, neuroticism was higher among those diagnosed with a substance use disorder when compared with the general population (Clemente-Suárez et al., 2022). These findings suggest that after experiencing childhood adversity, individuals high in neuroticism may experience a heightened risk for substance misuse when compared with individuals lower in neuroticism.

The influences of extraversion and neuroticism on the relationship between childhood adversity and substance misuse are yet to be examined among an adolescent sample. Due to the developmental differences and maturation processes that prevail during this period, the relationships that have been suggested by previous research on adult samples are not necessarily applicable to adolescents.

This current study sought to investigate the relationship between childhood adversity and adolescent substance misuse, alongside the influences of extraversion and neuroticism, using data from a prospective longitudinal birth cohort study. A series of demographic factors that have shown associations with childhood adversity in previous research (Fergusson & Horwood, 2001; Woodward et al., 2023) were included in adjusted analyses to attempt to minimise the likelihood of confounding with the childhood adversity measure. After controlling for these covariates (Woodward et al., 2023), childhood adversity was hypothesised to predict greater

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levels of adolescent substance use disorder symptoms. Further, it was hypothesised that individuals reporting high levels of extraversion would demonstrate fewer symptoms of substance use disorder after adverse childhood experiences when compared with individuals low in extraversion. Contrastingly, it was hypothesised that individuals reporting high levels of neuroticism would demonstrate greater symptoms of substance use disorder after adverse childhood experiences when compared with individuals low in neuroticism.

METHODS

Participants

This study analysed data from 911 participants of the Christchurch Health and Development Study (CHDS) in Aotearoa, New Zealand. The CHDS is a longitudinal birth cohort study consisting of individuals born in the urban region of Christchurch, New Zealand, within a 4-month period during 1977. At the beginning of the cohort, 635 male and 630 female participants were involved in this study. Of these, 11.2% were of Māori ethnicity, 2.9% were of Pacific ethnicity and 85.9% were of New Zealand European/'other' ethnicity. Data were obtained from those with scores on measures of childhood adversity, neuroticism and extraversion (at age 14 years) and adolescent alcohol and cannabis use disorder symptoms ($N = 911$). Participant consent, or assent, was obtained for all data collection phases. The cohort has been assessed on 24 occasions, from birth to age 40. Ethical approval was granted by the New Zealand Health and Disabilities Ethics Committee. A detailed overview of the CHDS has been provided by Fergusson and Horwood (2001).

Materials

Participant data were collected through various sources according to a multiple informant model. These sources included parents, teachers and cohort members (from age 7 onwards).

Childhood adversity score

Childhood adversity levels were measured using the childhood adversity (CA) score developed by the CHDS (Woodward et al., 2023). This score was composed of 20 indicators of childhood adversity across five domains: poverty, parental problems, family violence and abuse, adolescent mental health/psychological problems and adolescent adjustment problems. Full descriptions of materials and measures utilised in the development of the CA score can be found in Supporting Information S1.

Recent literature tends to consider childhood adversity primarily in terms of childhood trauma. However, it is clear that not all adversity experienced in childhood can be regarded as traumatic (Pearce et al., 2019), and it could be argued that trauma is more usefully conceptualised as a reaction to adversity. Therefore, the CA score did not focus on trauma. Furthermore, the development of the CA score relied on measures that were obtained prospectively rather than retrospectively, for the purposes of reducing bias and improving accuracy. Accordingly, more recent instruments, such as the Childhood Trauma Questionnaire-Short Form (CTQ-SF) (Hagborg et al., 2022), the Davidson Trauma Scale (Davidson et al., 1997) and the International Trauma Questionnaire (ITQ) (Cloitre et al., 2018), that focus primarily on trauma would require retrospective recall when participants became adults and were therefore not used in the present study.

Extraversion and neuroticism

Participants' extraversion and neuroticism levels were assessed using a short form version of the Eysenck Personality Inventory (EPI) (Eysenck & Eysenck, 1976) at 14 years (during the year 1991). The EPI contains 20 self-reported items collectively, with 10 items corresponding to a sub-scale measuring extraversion–introversion and 10 items on a sub-scale measuring neuroticism–stability. Responses to various questions were measured on a 3-point Likert scale, with 1 indicating *not like me*, 2 indicating *a bit like me* and 3 indicating *a lot like me*. Neuroticism and extraversion levels were calculated by summing items in each sub-scale, with higher scores on each sub-scale indicating higher levels of each trait. These scores ranged from 10 to 30. Extraversion and neuroticism scales of the EPI have demonstrated adequate reliability and internal consistency in previous analyses on the CHDS dataset ($\alpha = 0.83$ and $\alpha = 0.80$, respectively) (Newton-Howes et al., 2015).

Alcohol and cannabis use disorder symptoms

Adolescent alcohol and cannabis use disorder symptoms were measured according to the number of alcohol-related or cannabis-related problems prevalent during the 12-month period prior to assessments at ages 15 and 16 years. These measures correspond to symptoms presented in the years 1991 and 1992. To obtain this

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information, the Diagnostic Interview Schedule for Children (DISC) (Costello et al., 1985) was administered through interview assessments. Questions in this measure provided information based upon the DSM-III-R criteria for symptoms of alcohol use disorder and substance use disorder. Participant responses were summed across the two assessments for both types of symptoms to give the total number of alcohol use disorder and cannabis use disorder symptoms experienced over a 2-year period. These scores ranged from 0 to 29.

Covariates

Covariate factors were identified and controlled for as informed by previous CHDS analyses (Woodward et al., 2023). The age of the cohort member's mother was recorded at birth to provide a measure of maternal age at birth. Maternal and paternal education levels were measured using a three-level Likert scale, with 1 indicating *no secondary school*, 2 indicating *secondary school qualifications only* and 3 indicating *tertiary level qualifications*. Parental socio-economic status at the time of the cohort member's birth was assessed using the Elley and Irving (1976) scale of socio-economic status for New Zealand. This index is used to rank families across six levels of socio-economic status based upon paternal occupation. Prior to this analysis, this scale was collated into three levels: (a) for Levels 1–2 (professional and managerial), (b) for Levels 3–4 (clerical, technical and skilled) and (c) for Levels 5–6 (semi-skilled, unskilled and unemployed). Māori ethnicity, considered to be present within any cohort member whose parent reported either Māori ethnicity or Māori ancestry, was recorded at birth. Parental figure change was calculated by recording the total number of changes in parental figures in the home from birth to age 16 years. This included parental figure change through breakdown, divorce, death and repartnering/remarriage. Novelty-seeking items from the Tridimensional Personality Questionnaire ($\alpha = 0.80$) (Cloninger, 1987) were used to assess novelty seeking at age 16 years.

Procedure

Data collection and storage

Data collection for the CHDS began in Christchurch, New Zealand, in 1977. All mothers that gave birth to live infants in either public or private maternity units in this region during this period were contacted. The CHDS cohort was obtained after 97% of mothers who were recruited for the study agreed to their infants' participation. Further details of data collection and storage can be found in Fergusson and Horwood (2001).

Construction of the CA score

The five domains of childhood adversity considered in the CA score were informed by previous research and identified through confirmatory factor analysis (CFA) of data from the sources noted above. In well-fitting models, comparative fit index (CFI) values should be approaching 1, root mean square error approximation (RMSEA) should be less than 0.05 and standardised root mean square residual (SRMR) should be close to 0 (Fergusson & Horwood, 2001). The results of the CFA showed that a single factor structure was found to provide a good fit to the data ($\chi^2[4] = 7.51$, $p = 0.11$; RMSEA = 0.03; CFI = 0.99; SRMR = 0.02) (Fergusson & Horwood, 2001). Information gathered from participants during this data collection procedure, alongside rationale from relevant previous research, was used to define a cut-off score or develop a dichotomous variable for each of the 20 measures outlined in Supporting Information S1. Responses were dichotomised to indicate either the presence or absence of adversity for each measure. The CA score was constructed by taking the sum of the number of adversities present within each domain for each participant. These scores ranged from 0 to 17. Childhood adversity scores were classified into one of five factor score levels (1–5) by the CHDS, with higher levels indicating higher levels of adversity.

Statistical analyses

To obtain results for this study, longitudinal data from the CHDS were analysed using IBM SPSS Statistics (Version 28) (IBM Corporation, 2020) software and the IBM SPSS Hayes' (2012) Process (Process) software extension. Participants displaying missing data were omitted from analyses using case-wise deletion. A composite variable of participants' number of overall substance use disorder symptoms was created using the sum of alcohol use disorder symptoms and cannabis use disorder symptoms. Descriptive statistics were then produced. Assumptions of normality and multicollinearity were checked. Using a five-level categorical transformation of the CA score, descriptive statistics were calculated for extraversion, neuroticism and substance use disorder symptoms at five different levels of childhood adversity. To investigate potential confounds in the focal relationship, the significance (p) values of correlations between childhood

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adversity and previously identified covariates (Woodward et al., 2023) were examined.

To investigate the moderating roles of extraversion and neuroticism in the focal relationship, a hierarchical linear regression containing both extraversion and neuroticism as moderators was run, and previously identified covariates were controlled for (Woodward et al., 2023). All predictor variables were mean centred, and their centred interaction terms ('Childhood adversity' * 'Extraversion' and 'Childhood adversity' * 'Neuroticism') were calculated to be used in moderator analyses. Covariates were entered into the first block of the linear regression model using the 'enter' method. The independent and moderator variables were then respectively entered into separate blocks, and the moderator variables' corresponding interaction terms were entered into the final block of the relevant regression model. The conditional effects of childhood adversity on substance use disorder symptoms were examined at one standard deviation above the mean, at one standard deviation below the mean and at the mean of moderator variables in Process to examine the nature of any significant interactions. Simple slopes were examined.

RESULTS

Descriptive statistics, assumptions and covariates

To investigate how the moderator and outcome variables varied as a function of childhood adversity, descriptive statistics pertaining to extraversion, neuroticism and substance use disorder symptoms were calculated across five categorical levels of childhood adversity. As can be seen in Table 1, mean scores and standard deviations for neuroticism and substance use disorder symptoms were greater for higher childhood adversity levels. Collinearity diagnostics, including variance inflation factor (VIF) and tolerance values, indicated that the assumption of multicollinearity was not violated.

Pearson's r correlation coefficients were computed for the predictor, moderator and outcome variables. These indicated that childhood adversity ($r[971] = 0.39$, $p < 0.001$) was moderately positively correlated to substance use disorder symptoms. Extraversion ($r[958] = 0.12$, $p < 0.001$) and neuroticism ($r[958] = 0.13$, $p < 0.001$) were positively correlated with substance use disorder symptoms to a weak degree. Extraversion was not significantly correlated with childhood adversity. However, neuroticism was moderately positively correlated with childhood adversity ($r[957] = 0.32$, $p < 0.001$). There was a weak negative correlation between extraversion and neuroticism ($r[975] = -0.15$, $p < 0.001$).

Correlations between childhood adversity scores and previously identified covariate factors (Woodward et al., 2023) are shown in Table 2. Results indicated that gender, maternal age at birth, maternal education level, paternal education level, parental socio-economic status,

TABLE 2 Associations between covariate factors and childhood adversity score.

Covariate factor	Childhood adversity score
Gender	0.09*
Maternal age at birth	−0.31**
Maternal education level	−0.32**
Paternal education level	−0.28**
Parental SES	0.35**
Māori ethnicity	−0.24**
Parental figure change	0.55**
Novelty seeking	0.22**

Note: Values indicate Pearson's (r) correlation coefficients.
Abbreviation: Parental SES, parental socio-economic status at birth.
*$p < 0.01$ (two-tailed).**$p < 0.001$ (two-tailed).

TABLE 1 Descriptive statistics by categorical childhood adversity level.

		CA score category				
Variable	**Descriptives**	**1**	**2**	**3**	**4**	**5**
Extraversion	*M*	23.11	22.90	23.52	23.70	23.62
	SD	4.30	4.80	4.20	4.62	4.96
Neuroticism	*M*	13.02	13.74	14.43	15.69	18.44
	SD	2.83	3.47	3.77	4.44	5.05
Substance use disorder symptoms	*M*	0.06	0.28	0.75	2.15	3.80
	SD	0.29	1.03	1.98	3.85	5.18
Overall	Valid *N*	263	280	229	148	39

Abbreviations: CA score category, five-level categorical transformation of childhood adversity score; *M*, mean; *SD*, standard deviation.

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Māori ethnicity, parental figure change and novelty-seeking factors were all significantly correlated with childhood adversity scores and therefore should be controlled for in further analyses.

Moderator analysis

To investigate the moderating roles of extraversion and neuroticism in the relationship between childhood adversity and substance use disorder symptoms after controlling for the identified confounds, a hierarchical multiple linear regression was performed. All significant covariate factors were included in block one of the linear regression model. In the same model, childhood adversity was added to block two, extraversion and neuroticism were added to block three and the interaction terms ('Childhood adversity * Extraversion' and 'Childhood adversity * Neuroticism') were added to the final block. The unstandardised regression coefficients, standardised beta values and corresponding 95% confidence intervals for these relationships are shown in Table 3.

Childhood adversity and extraversion variables were significantly positively related to substance use disorder symptoms. Of all computed effect sizes for substance use disorder symptoms, the strongest was for the direct effect of childhood adversity. Although neuroticism was not a significant predictor of substance use disorder symptoms, the Childhood adversity * Neuroticism interaction was significant. The inclusion of the interaction terms in the final block of the regression model explained a significant additional proportion of the variance in substance use disorder symptoms ($\Delta R^2 = 0.02$, $F[2, 897] = 13.68$, $p < 0.001$), indicating a significant interaction effect.

To explore the nature of this interaction, the conditional effects of childhood adversity at different values of extraversion and neuroticism were examined in Process. Confidence intervals and two-tailed significance (p) values indicated that the relationship between childhood adversity scores and substance use disorder symptoms was significant at all levels of extraversion and at all levels of neuroticism (see Table 4). Analysis of simple slopes revealed that the relationship between childhood adversity and substance use disorder symptoms was strongest when extraversion was high (see Figure 1a). Similarly, the strength of the relationship between childhood adversity and substance use disorder symptoms was greatest when neuroticism was high (see Figure 1b). However, the magnitude of the slope corresponding to the relationship involving extraversion as a moderator was comparatively greater than the magnitude of the slope corresponding to the relationship involving neuroticism as a moderator.

TABLE 3 Table of model summary statistics after controlling for covariates.

					95% confidence interval	
Variable	***B***	***β***	***SE***	***p***	**Lower**	**Upper**
Childhood adversity	0.27	0.37	0.03	<0.001	0.21	0.32
Extraversion	0.04	0.08	0.02	0.012	0.01	0.07
Neuroticism	0.02	0.04	0.02	0.300	−0.02	0.06
Childhood adversity * Extraversion	0.02	0.15	0.01	<0.001	0.01	0.03
Childhood adversity * Neuroticism	0.01	0.08	0.01	0.012	0.00	0.02

Note: Outcome variable = substance use disorder symptoms.
Abbreviations: *B*, unstandardised regression coefficient; *SE*, standard error of estimate; *β*, standardised beta.

TABLE 4 Effects of childhood adversity on substance use disorder symptoms at different values of extraversion and neuroticism.

Moderator				95% confidence interval	
Extraversion	**Neuroticism**	***B***	***p***	**Lower**	**Upper**
−1*SD*	*M*	0.16[a]	<0.001	0.09	0.24
M	*M*	0.27[a]	<0.001	0.21	0.32
+1*SD*	*M*	0.37[a]	<0.001	0.30	0.44
M	−1*SD*	0.22[b]	<0.001	0.14	0.29
M	*M*	0.27[b]	<0.001	0.21	0.32
M	+1*SD*	0.31[b]	<0.001	0.25	0.37

Abbreviations: *B*, unstandardised regression coefficient; *M*, mean; *SD*, standard deviation.
[a]Unstandardised regression coefficient for extraversion.
[b]Unstandardised regression coefficient for neuroticism.

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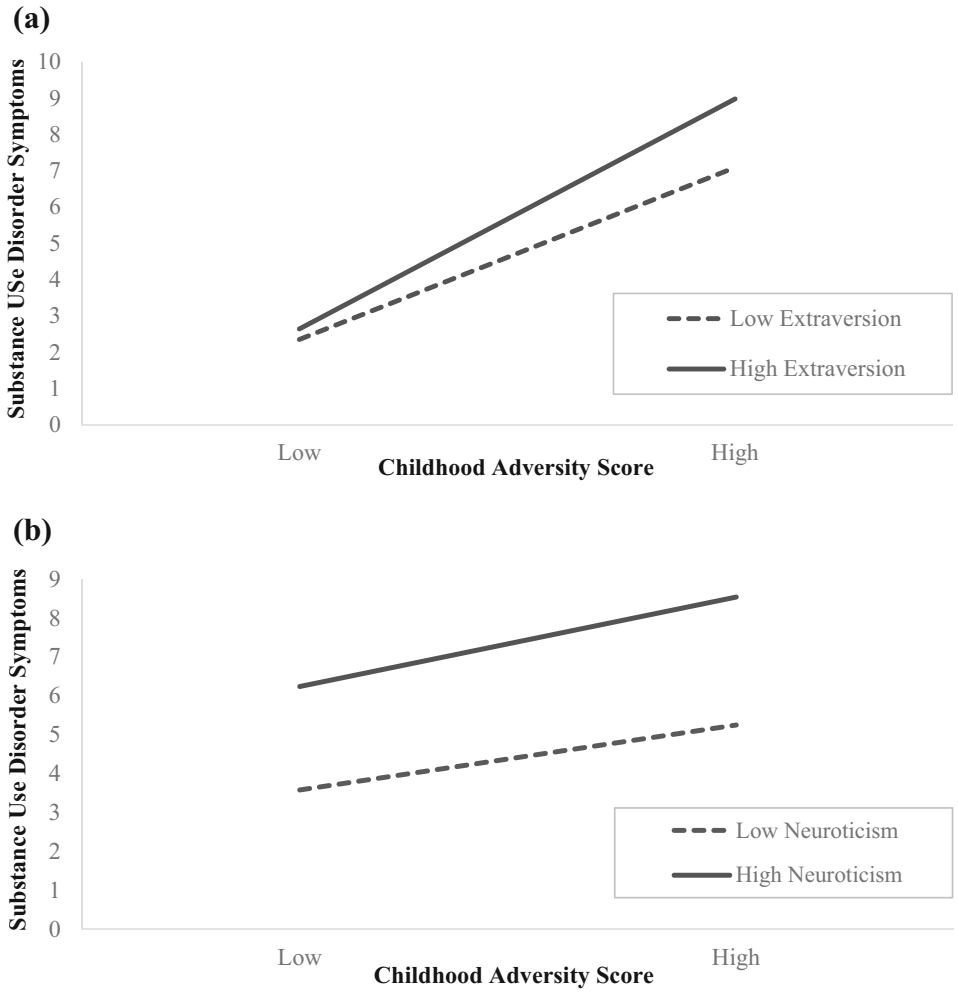


FIGURE 1 Graph of the relationship between childhood adversity and substance use disorder symptoms at high and low levels of (a) extraversion and (b) neuroticism. 'Low' levels = one standard deviation below the mean. 'High' levels = one standard deviation above the mean.

Note. 'Low' levels = One standard deviation below the mean. 'High' levels = One standard deviation above the mean.

DISCUSSION

This study hypothesised that adolescents reporting higher levels of childhood adversity would report greater symptoms of substance use disorder. It was also hypothesised that adolescents reporting higher levels of extraversion would demonstrate fewer symptoms of substance use disorder after adverse childhood experiences when compared with individuals low in extraversion. Contrastingly, it was hypothesised that adolescents reporting high levels of neuroticism would demonstrate greater symptoms of substance use disorder after adverse childhood experiences when compared with adolescents low in neuroticism. Findings confirmed that those with higher levels of childhood adversity demonstrated greater substance use disorder symptoms. Higher levels of extraversion were associated with a stronger relationship between childhood adversity and substance use disorder symptoms. This result contradicted what was hypothesised, suggesting that unique facets of the adolescent period (heightened socialisation, substance exposure and vulnerability) may explain differences in the influences of extraversion and neuroticism in the relationship between childhood adversity and substance misuse during adolescence. Findings also showed that higher levels of neuroticism were associated with a stronger relationship between childhood adversity and substance use disorder symptoms, aligning with our hypothesis.

Childhood adversity

Findings from this study are consistent with a plethora of research demonstrating the influential role of childhood adversity in the development of substance misuse behaviours. Individuals who have experienced childhood adversity, particularly adolescents and youth, may misuse substances in an attempt to address the traumatic stress that results from their past experiences (Khoury et al., 2010). This is thought to be a form of self-

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medication that arises in an attempt to alleviate the psychological distress associated with their experiences and escape from invasive memories (Garland et al., 2013; Gray & Squeglia, 2018). Additionally, substances may be misused in an attempt to make traumatic relationships during youth more tolerable (Garland et al., 2013). This study reiterates childhood adversity as a fundamental risk factor for the development of substance misuse as early in life as adolescence.

The influence of extraversion

Increased socialisation and substance exposure, in combination with adolescent vulnerability, may explain the unexpected finding that higher levels of extraversion were associated with greater substance use disorder symptoms after accounting for experiences of childhood adversity in adolescence. In adolescence, peer influence amid social environments has been associated with the initiation of drug and alcohol behaviour (Bauman & Ennett, 1996; Gray & Squeglia, 2018). Further, heightened neurological and biological vulnerability increases the likelihood that substance use will manifest into substance misuse (Boden & Fergusson, 2011; Thoma et al., 2011). This is pertinent when considering the addition of childhood adversity experiences, as adolescents have been shown to use substances as a way to cope with the physical or emotional pain stemming from trauma or adversity (Ayres, 2021; Garland et al., 2013). When considered in combination, these findings suggest that adolescents who have experienced childhood adversity and are high in extraversion may be more likely to misuse substances than those who have experienced childhood adversity and are low in extraversion.

The influence of neuroticism

Dispositions for negative emotionality, an integral aspect of neuroticism (Widiger & Oltmanns, 2017), may influence individuals' tendencies to misuse substances after experiences of childhood adversity (Fuchshuber & Unterrainer, 2020). Among those high in neuroticism, maladaptive substance use is thought to partially result from an effort to diminish the anxiousness, emotional instability and dysphoria associated with their baseline negative emotionality (Widiger & Oltmanns, 2017). This is pertinent during adolescence, given that heightened neurological and biological vulnerability increases the likelihood that substance use will lead to substance misuse (Boden & Fergusson, 2011; Thoma et al., 2011). When combined with the psychological distress that accompanies experiences of childhood adversity and the increased tendency to experience frequent unpleasant event rehearsal that has been linked with neuroticism (Widiger & Oltmanns, 2017), this method of maladaptive coping with psychological distress may partially explain the increased association between childhood adversity and substance misuse that exists among adolescents high in neuroticism.

Implications, limitations and future research

Findings from this study highlight the importance of professionals in the mental health sector targeting substance misuse prevention programmes such as social resistance skills education, normative education or competence enhancement (Griffin & Botvin, 2010) towards adolescents who have experienced childhood adversity and are high in extraversion and/or neuroticism. Similarly, this study encourages relevant professionals to target interventions such as motivational enhancement therapy or a screening and brief intervention (Griffin & Botvin, 2010) towards adolescents who have experienced childhood adversity and are high in extraversion and/or neuroticism after substance misuse behaviours begin to raise concern.

This study has various strengths, including a longitudinal design utilised on a sizeable sample, the use of multiple measures and reporters to provide a comprehensive score of childhood adversity across various domains and the consideration of a wide array of evidence-supported covariates from diverse childhood and adolescent experiences. Given the methodology utilised in previous literature, these findings are significant as they are the first to analyse the focal relationships in a large, longitudinal, solely adolescent sample. Therefore, this study's findings highlight the potentially unique role of extraversion in the relationship between childhood adversity and substance misuse during adolescence while extrapolating research that pinpoints neuroticism as a risk factor for substance misuse after experiences of childhood adversity to a sample of adolescents.

Despite these strengths, this study's findings should be interpreted in light of its limitations. All data pertaining to substance use disorder symptoms were collected from participants between the ages of 14 and 16 years, meaning that relationships found in statistical analyses may not necessarily be applicable to the entire adolescent developmental period. This study's sample consisted of participants from the same demographic location, meaning geographical bias may be apparent. The generalisability of these findings to populations outside of New Zealand is unknown, and any relationships should

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only be extrapolated to non-New Zealand samples with reservations. Additionally, it is possible that the epidemiology of substance misuse is impacted by the time period that these data pertain to. Adolescents in this sample presented their assessed features during the years 1991, 1992 and 1993. This coincides with the rise in youth illicit substance misuse that prevailed during the 1990s (Gfroerer, 2018), meaning findings from this study may be influenced by cohort effects. Thus, the relationships found in this particular cohort may not be entirely generalisable to adolescents today.

Future researchers may build upon this study's findings by examining the roles of extraversion and neuroticism in the relationship between childhood adversity and substance use disorder symptoms across developmental periods. While further research is required to comprehensively understand how this relationship unfolds across the lifespan, this study provides novel insights into the roles of personality traits in the relationship between childhood adversity and substance misuse during adolescence.

CONFLICT OF INTEREST STATEMENT

No real potential conflict of interest has been reported.

ACKNOWLEDGEMENTS

Open access publishing facilitated by University of Canterbury, as part of the Wiley - University of Canterbury agreement via the Council of Australian University Librarians.

DATA AVAILABILITY STATEMENT

Data will be made available upon request from the corresponding author (J. M. B.).

ETHICS STATEMENT

Ethical approval was granted by the New Zealand Health and Disabilities Ethics Committee.

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How to cite this article: Davies, J. N., Harty, S. C., & Boden, J. M. (2024). The roles of extraversion and neuroticism in the relationship between childhood adversity and adolescent substance misuse. *Personality and Mental Health*, *18*(3), 238–247. https://doi.org/10.1002/pmh.1611

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