**Online-only Supplementary Material**

**Boden, JM, Foulds, JA, Newton-Howes, G., & McKetin, R. “Methamphetamine use and psychotic symptoms: findings from a New Zealand longitudinal birth cohort”**

**Confounding factors**

A number of potential confounding factors were abstracted from the study database, on the basis that they have been shown to be related to both methamphetamine use and psychotic symptomatology in adolescence and adulthood. These factors included:

***Family socio-demographic background***

***Family living standards (0-10 years).*** At each year a global assessment of the material living standards of the family was obtained via interviewer rating. Ratings were made on a five point scale that ranged from “very good” to “very poor”. These ratings were averaged over the 10 year period to give a measure of typical family living standards during this period.

***Family functioning factors in childhood***

***Changes of parents (to age 15).***As part of the study data on changes of parents were collected at annual intervals (Fergusson, Horwood, & Lynskey, 1994). These data were used to construct a measure of the number of changes of parent figures during the interval from birth to the age of 15 years, including changes due to parental separation/divorce, reconciliation, remarriage, death, and other changes of custodial parents.

***Parental intimate partner violence (IPV).***At the age of 18, sample members were questioned concerning their experience of violence between parental figures during their childhood (prior to age 16 years), with questions derived from Conflict Tactics Scale (CTS; Straus, 1979). The items were chosen on the basis that the behaviors could have been readily observed and reported on by the participant, and also to span the potential range of violent behavior from verbal abuse to physical assault. Separate questioning was conducted for violence initiated by the father against the mother and for violence initiated by the mother against the father, and combined into a single scale score representing overall exposure across both parents.

***Parental history of alcohol problems.***At the 15 year assessment, the parents of cohort members were questioned concerning their history of alcoholism or alcohol problems. On the basis of this questioning 11.9% of the sample were classified as having a parental history of alcoholism/alcohol problems.

***Parental history of criminal offending.*** When participants were aged 15 years, parents were questioned about their involvement in criminal offending. Participants were classified as having a parental history of criminal offending if any parent reported a history of criminal offending (12.4% of the cohort).

***Parental history of illicit substance use.***When sample members were aged 11 their parents were questioned about parental usage of illicit drugs including cannabis. On the basis of this questioning 27.5% of the sample were classified as having parents who used cannabis or other illicit drugs.

## *Parental Bonding (Maternal and Paternal Care and Protection) .* To measure parental bonding, the maternal care and protection scales of the Parental Bonding Instrument (PBI; Parker, Tupling & Brown, 1979) were administered to the cohort members at the age of 16 years. The young person was asked to rate her mother on the PBI items describing the quality of maternal care and protection throughout their childhood. The care scale measures the extent to which the parents provide support, affection and nurturing with a high score indicating high levels of care. The protection scale measures the extent to which parents exhibit tendencies to over protection or over control with a high score indicating tendencies to over control. The reliabilities of the resulting scale scores were assessed using coefficient alpha and found to be good: maternal care α = .89; paternal care α = .91; maternal over protection α = .85; paternal over protection α = .87.

***Child abuse***

***Childhood sexual abuse.***At ages 18 and 21 years sample members were questioned about their experience of sexual abuse during childhood (<16 years) (Fergusson, Horwood, & Woodward, 2000; Fergusson, Lynskey, & Horwood, 1996). Questioning spanned an array of abusive experiences from episodes involving non-contact abuse (e.g. indecent exposure) to episodes involving attempted or completed intercourse. Sample members who reported an abusive episode were then questioned further about the nature and context of the abuse. Using this information a 4-level scale was devised reflecting the most extreme form of sexual abuse reported by the young person at either age. This classification was: no sexual abuse; non-contact abuse only; contact sexual abuse not involving attempted or completed intercourse; attempted/completed oral, anal, or vaginal intercourse.

***Parental use of physical punishment (childhood physical abuse).***At ages 18 and 21 sample members were asked to describe the extent to which their parents used physical punishment during childhood (Fergusson et al., 2000; Fergusson & Lynskey, 1997). Separate questioning was conducted for mothers and fathers. This information was used to create a 4-level scale reflecting the most severe form of physical punishment reported for either parent: parents never used physical punishment; parents rarely used physical punishment; at least one parent used physical punishment on a regular basis; at least one parent used physical punishment too often or too severely, or treated the respondent in a harsh or abusive manner.

***Individual factors***

 ***Sex.*** Recorded at birth.

***Child behavior problems (ages 7-9; conduct and attention problems).***When sample members were aged 7, 8, and 9 years, information on child behavior problems was obtained from parental and teacher report. Parental reports were obtained from an interview with the child’s mother using a behavior questionnaire that combined items from the Rutter (1970) and Conners (1970) parental questionnaires. Parallel to the maternal report, the child’s class teacher was asked to complete a combined version of the Rutter (1970) and Conners (1969) teacher questionnaires. Factor analysis of the item-level report data showed that it was possible to select items from these reports that formed uni-dimensional scales reflecting the extent of parent-reported and teacher reported behavior problems in two domains of behavior (Fergusson & Horwood, 1993; Fergusson, Horwood, & Lloyd, 1991): a) conduct problems: the extent to which the child exhibited aggressive, oppositional, and conduct disordered behaviors; and b) attentional problems: the extent to which the child exhibited restless, inattentive, or hyperactive behaviors. For the purposes of the present analysis, the parent and teacher reports were summed for each domain and the resulting scores averaged over the three year period to produce two scale score measures reflecting the extent of the child’s tendencies to conduct problems and attentional problems at ages 7-9. The alpha reliabilities of these scales were .97 and .93, respectively.

***Adolescent adjustment***

***Self-esteem (age 15)****.* Self-esteem was assessed at age 15 using the global measure from the Coopersmith Self Esteem Inventory (1981). The overall measure of self-esteem was generated by summing of the four subscale scores (general, academic, social, and home). The full scale score used in these analyses was found to be internally consistent ( = 0.87).

## *Novelty Seeking (age 16).* When sample members were aged 16 years they were administered the novelty seeking items of the Tridimensional Personality Questionnaire (Cloninger, 1987). Novelty seeking assesses the extent to which the individual is "impulsive, exploratory, excitable, disorderly and distractible" (p. 411). These items were summed to produce an overall novelty seeking measure. The reliability of this scale was assessed using coefficient alpha and found to be moderately good (α = .76).

***Conduct disorder (age 14-16).*** At ages 15 and 16, sample members were interviewed on a comprehensive mental health interview that examined aspects of mental health and adjustment over the previous 12 months. A parallel interview was also conducted with the child’s mother at the same assessment stage. As part of the assessments information was obtained on DSM-III-R (American Psychiatric Association, 1987) symptom criteria for disruptive childhood behaviours over the previous 12 months, including conduct disorder (CD). For child self-report, CD was assessed using the Self-Report Early Delinquency (SRED) scale (Moffitt & Silva, 1988). For parental reports CD was assessed using a parent version of the SRED. The observed symptom reports were used to derive a dichotomous measure of whether the cohort member met DSM criteria for conduct disorder on the basis of either self or parent report at age 14-16.

***Adolescent anxiety disorder (age 15).***At age 15 sample members and their parents were interviewed separately concerning the extent of the young person’s symptoms of anxiety disorders during the preceding year. Symptomatology was assessed using items from the self-report and parent report forms of the Diagnostic Interview Schedule for Children (Costello, Edelbrock, Kalas, Kessler, & Klaric, 1984) respectively, supplemented by additional items to assess DSM-III-R criteria. On the basis of this information, sample members were classified as having anxiety disorder during the period 14-15 years if, on the basis of either parent or self report, they met DSM-III-R criteria for an anxiety disorder.

***Deviant Peer Affiliations (age 15).*** At age 15 years, sample members were questioned on a series of items relating to patterns of substance use and antisocial behaviours amongst their friends. These items assessed the extent to which their friends used alcohol, tobacco, cannabis, truanted or were suspended from school, or broke the law (Fergusson, Woodward, & Horwood, 1999). These items were combined to produce a scale score measure representing the extent of the young person’s reported affiliations with delinquent or substance using peers at age 15. The reliability of this scale, assessed using coefficient alpha, was .77.

**Time-dynamic covariate factors *(ages 16-18, 18-21, 21-25, 25-30, and 30-35 years)***

It could be argued that any associations between methamphetamine use and psychotic symptomatology may in part be mediated by mental health and substance use disorders occurring contemporaneously with psychotic symptomatology. In addition, life stress may also be regarded as a possible mediator of this association. In order to examine this issue, a series of measures of mental health and substance use disorder, along with life stress were selected from the study database. These measures included:

***Major depression, anxiety disorders, alcohol use disorder, frequency of cannabis use.*** To control for any possible effects of correlated mental health and substance use disorders, time-dynamic measures of DSM-III-R (American Psychiatric Association, 1987) or DSM-IV (American Psychiatric Association, 1994) major depression, anxiety disorders, and alcohol use disorder were used. At ages 18, 21, 25, 30, and 35 years, participants were questioned regarding symptoms of the above-named disorders during the period since the previous assessment using CIDI (World Health Organization, 1993) items and either DSM-IV diagnostic criteria. Sample members who met DSM-III-R (ages 16-18) or DSM-IV (age 18 onward) diagnostic criteria for any disorder during any assessment period (ages 16-18, 18-21, 21-25, 25-30, and 30-35 years) were classified using a series of dichotomous measures as having that specific disorder during that period.

Frequency of cannabis use was assessed at each wave of data collection (ages 18, 21, 25, 30, and 35 years) using a five point scale representing the maximum frequency with which the participant reported using cannabis during the assessment period. The five point scale ranged from “never” to “at least weekly”.

***Stressful life events.*** To control for any possible effects of stressful life events in linking abuse exposure and psychotic symptomatology, time-dynamic measures of stressful life events were used. Exposure to stressful life events was assessed by questioning respondents about life events for each 12-month period over the periods 25-30 and 30-35 years. Life events were assessed using a 30-item inventory based on the Holmes and Rahe (1967) Social Readjustment Rating Scale supplemented by custom-written survey items. These items spanned several domains, including: changes to living situation; death/illness; relationship problems/difficulties; problems with family members/family members’ crises; problems with friends/friends’ crises; crime victimisation; and other problems. All items were scored on a 0 to 4 scale with 0 representing “no event”, 1 “not upset/distressed”, 2 “a little upset/distressed”, 3 “moderately upset/distressed”, and 4 “very distressed”, based on the recommendations by Brown and Harris (Brown & Harris, 1978) Using this information, a measures of exposure to stressful life events was created, computed by summing the 0 to 4 scaling for each item for each 12-month period, and then summing over each assessment period, resulting in a total life events distress score for the periods 16-18, 18-21, 21-25, 25-30, and 30-35 years.

**Table S1 Psychotic symptomatology items from the SCL-90 (administered at ages 18, 21 and 25 years)**

|  |  |
| --- | --- |
| Symptoms | % reporting at each assessment |
|  | Age 18 | Age 21 | Age 25 |
| The idea that someone else can control your thoughts | 3.6 | 4.8 | 2.6 |
| Hearing voices that other people do not hear | 2.1 | 1.7 | 2.1 |
| Other people being aware of your private thoughts | 15.0 | 15.7 | 14.2 |
| Having thoughts that are not your own | 8.7 | 6.5 | 4.4 |
| Having ideas or beliefs that others do not share | 15.0 | 19.5 | 16.5 |
| The idea that something serious is wrong with your body | 2.8 | 2.9 | 2.6 |
| Never feeling close to another person | 18.3 | 18.8 | 15.9 |
| The idea that something is wrong with your mind | 7.7 | 8.8 | 7.7 |
| Feeling that other people cannot be trusted | 7.3 | 7.7 | 7.7 |
| Feeling that you are watched or talked about by others | 6.3 | 7.0 | 7.4 |

**Table S2 Psychotic symptomatology items from the DIS (administered at ages 30 and 35)**

|  |  |
| --- | --- |
| Symptoms | % reporting at each assessment |
|  | Age 30 | Age 35 |
| Believed you were being secretly tested or experimented on | 1.9 | 0.4 |
| Believed that someone was plotting against you or trying to hurt or poison you | 1.5 | 1.8 |
| Believed that someone was spying on you | 2.0 | 1.5 |
| Been bothered by the belief that someone was following you | 1.7 | 0.9 |
| Thought that people whom you didn’t know, were talking about you or laughing at you | 4.5 | 2.2 |
| Believed that someone was reading your mind | 1.6 | 0.4 |
| Believed that you could hear what another person was thinking, even though they were not speaking | 1.2 | 1.0 |
| Believed that others could hear your thoughts | 1.4 | 0.5 |
| Believed that a person, power or force could control your movements or thoughts against your will | 0.8 | 0.6 |
| Believed that someone or something could put thoughts into your mind that were not your own | 1.7 | 0.7 |
| Felt that someone or something took your thoughts out of your mind | 0.6 | 0.5 |
| Been convinced that someone you had not met was in love with you | 0.3 | 0.3 |
| Believed that you were being sent special messages through the television or radio, or that a programme, song or news story had been made just for you | 0.5 | 0.5 |
| Felt strange forces working on you, as if you were being hypnotised, hit by x-rays or laser beams, or as if magic was being performed on you | 0.4 | 0.0 |
| Believed that you did something terrible for which you should have been punished | 1.0 | 1.1 |

**Table S3. Spearman’s correlations between both: a) methamphetamine use; and b) psychotic symptomatology; and covariate factors.**

|  |  |  |
| --- | --- | --- |
| Covariate factors | Methamphetamine use | Psychotic symptomatology |
| **Childhood and adolescent factors** |  |  |
| Family living standards (ages 0-10) | -.02 | .09\* |
| Changes of parents (ages 0-15) | .04 | .09\* |
| Parental intimate partner violence (ages 0-16) | .02 | .11\* |
| Parental alcohol problems | .00 | .07\* |
| Parental history of offending | .11\*\* | .08\* |
| Parental history of illicit drug use | .07\* | .07\* |
| Maternal care (age 16) | -.04 | -.08\* |
| Paternal care (age 16) | -.06 | -.12\*\* |
| Maternal overprotection (age 16) | .04 | .07\* |
| Paternal overprotection (age 16) | .07\* | .09\* |
| Childhood sexual abuse | .02 | .12\*\* |
| Childhood physical abuse | .05 | .11\*\* |
| Female sex | -.09\* | -.01 |
| Child conduct problems (ages 7-9) | .07\* | .11\*\* |
| Child attention problems (ages 7-9) | .07\* | .09\* |
| Self-esteem (age 15) | -.07\* | -.24\*\*\* |
| Novelty-seeking (age 16) | .22\*\*\* | .14\*\*\* |
| Conduct disorder (ages 14-16) | .22\*\*\* | .18\*\*\* |
| Anxiety disorder (age 15) | -.03 | .08\* |
| Deviant peer affiliation (age 15) | .18\*\*\* | .17\*\*\* |
| **Time-dynamic factors (ages 16-35)** |  |  |
| Major depression | .09\* | .25\*\* |
| Anxiety disorder | .02\* | .21\*\*\* |
| Alcohol use disorder | .18\*\*\* | .17\*\*\* |
| Frequency of cannabis use | .33\*\*\* | .19\*\*\* |
| Life stress | .20\*\*\* | .17\*\*\* |

\* p < .05

\*\* p < .01

\*\*\* p < .001

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