Personality and Individual Differences 75 (2015) 179–184

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Weak etiologic links between control and the externalizing behaviors delinquency and substance abuse in adolescence

Karoline B. Seglem [a,*], Svenn Torgersen [a,b], Helga Ask [a], Trine Waaktaar [b]

[a] Centre for Child and Adolescent Mental Health (RBUP), PO Box 4623 Nydalen, 0405 Oslo, Norway
[b] Department of Psychology, University of Oslo, PO Box 1094 Blindern, 0317 Oslo, Norway

ARTICLE INFO

Article history:
Received 20 August 2014
Received in revised form 14 November 2014
Accepted 17 November 2014
Available online 6 December 2014

Keywords:
Control
Delinquency
Substance abuse
Externalizing
Heritability
Adolescence

ABSTRACT

Impulsive/disinhibitory personality traits have consistently been associated with externalizing symptomatology such as delinquency and substance use problems, often starting in adolescence. Yet the etiological nature of this co-occurrence is not well understood. Using a classic twin study design with self-report data from 717 male and female twin pairs, aged 15–18 years, a hierarchical psychometric model was examined. In this model the shared variance and etiological structure between control, delinquency and substance abuse symptoms, was modeled through a common externalizing factor. Model fitting indicated that the genetic and environmental influences differed in strength between male and female adolescents. The heritability of the externalizing factor was 45% in males and 10% in females, though neither was statistically different from zero. A statistically significant influence of shared environmental factors was seen for both sexes, 21% in males and 54% in females. In both sexes, the externalizing factor accounted for little variance in control, indicating a weak association and little shared etiology with externalizing liability. These results illuminate further that facets of impulsivity are differentially associated with vulnerability for externalizing symptomatology.

1. Introduction

Research suggests that impulsive/disinhibitory traits, evident already in early childhood, are the basis or first manifestation of externalizing symptomatology and may be precursors to alcohol and drug experimentation and delinquent behavior once the opportunities for these behaviors arise, usually in adolescence (Caspi, Moffitt, Newman, & Silva, 1996; Masse & Tremblay, 1997). Although studies have consistently shown associations between impulsivity/disinhibition, antisocial behavior and substance use problems in adolescent populations (e.g. Chassin, Flora, & King, 2004), the etiological nature of this co-occurrence is not well understood. A critical limitation to previous research is the inconsistent operationalization of impulsivity/disinhibition across studies (see Sharma, Markon, & Clark, 2014 for a review). For further progress in the field, studies relating distinct facets of impulsivity to externalizing symptomatology are needed. The present study examines whether a clear operationalization of impulsivity, namely control, can be modeled as part of a latent externalizing liability factor together with delinquency and symptoms of substance abuse, as well as the etiological structure using a genetically informative sample of Norwegian adolescents aged 15–18.

Recent efforts to distinguish different facets of impulsivity indicate that there are several weakly or moderately correlated traits that are frequently used to represent impulsivity/disinhibition, and that are differentially linked to various types of externalizing behavior (Dick et al., 2010; Sharma et al., 2014). For example, low control has been directly associated with non-aggressive rule-breaking or antisocial behavior, but not with aggressive antisocial behavior (Burt & Donnelan, 2008).

Findings of a broad latent externalizing factor is explained by a common underlying genetic risk to putatively separate disorders, so-called pleiotropic effects, i.e. the same genes may dispose to a range of similar traits or behaviors (Kendler, Prescott, Myers, & Neale, 2003). Few genetically informed studies have investigated whether the etiology of disinhibitory personality traits may be modeled as part of a latent externalizing factor. One genetically informed study of 12–18 year old twins found that sensation/novelty seeking could be modeled as part of an externalizing factor (Young, Stallings, Corley, Krauter, & Hewitt, 2000). Another study of 17-year-old twins combined multiple traits, including control, harm avoidance and traditionalism, and found support for an association with the externalizing factor (Krueger et al., 2002). Both Young et al.'s and Krueger et al.'s study support the supposition

* Corresponding author. Tel.: +47 40042545.
E-mail address: kbs@r-bup.no (K.B. Seglem).

http://dx.doi.org/10.1016/j.paid.2014.11.036
0191-8869/

of an etiologic link between disinhibitory personality traits and psychopathology, and found a substantial genetic basis for the shared variance, a^2 = .84 and .81, respectively. However, it remains unknown whether the distinct measure of control is an indicator of an underlying vulnerability to externalizing symptomatology.

The current study examines adolescents aged 15–18, which is ideal for investigating the relationship between control, delinquency and substance abuse symptoms, as these traits/behaviors typically show an increase in prevalence and co-occurrence during the adolescent years (Collado, Felton, Macpherson, & Lejuez, 2014; Moffitt, 1993). We expected to find a shared etiological structure that could be modeled through a common externalizing factor. Due to the relative lack of studies investigating the etiology of externalizing symptoms in adolescence, and no previous studies that have included control as a distinct disinhibitory personality indicator, no specific hypotheses were made with regard to the relative strength of the etiological effects. However, based on previous findings of a strong genetic influence on externalizing liability, we did expect to find a highly heritable common factor also in the current study. Finally, epidemiological studies consistently show that adolescent males have greater prevalence of externalizing behaviors in general, they are involved in more delinquent acts and they abuse substances more often. However, it remains uncertain whether there are differences in the etiological structure of these behavioral patterns for adolescent males and females, as previous studies have provided inconsistent results (Hicks et al., 2007; Krueger et al., 2002). We therefore investigated potential sex differences in the etiology.

2. Methods

2.1. Sample and procedure

The sample consisted of adolescents who participated in a large scale population-based study consisting of seven cohorts of twins born in Norway between 1988 and 1994. The sample (N = 717 twin pairs, mean age = 16.25, range from 15 to 18 years old) included both male and female monozygotic (MZ) and dizygotic (DZ) pairs, and opposite-sex DZ pairs. Due to the nature of the study phenotypes, twins aged 12–14 were excluded from the present study. Data were collected by self-administered mail questionnaires. Zygosity was determined through a combination of questionnaire data on twin physical similarity and DNA secured through cheek swabs from a subsample of the participants. More details about sample characteristics and procedure can be found elsewhere (Waaktaar & Torgersen, 2012).

2.2. Measures

Control was measured as the mean score of seven items from the control subscale in the Multidimensional Personality Questionnaire (MPQ; Tellegen, 1982). Items were scored on a three-point scale from 0: "is not", to 1: "partially", and 2: "exactly", based on how typical the statements were of the youth's behavior in the preceding 12 months. The scale included the following items: "I often act without thinking", "I am more likely to be fast and careless than to be slow and plodding", "I usually make up my mind through careful reasoning", "I plan and organize my work in detail", "People say that I am methodical (that I do things in a systematic manner)", "I am a cautious person", "I often like to do the first thing that comes to my mind". Four items were reversed scored so that higher values reflected more impulsive behavior. Cronbach's alpha was .61 and Principal components analysis supported a unidimensional factor, with all item factor loadings above .4.

Delinquency was measured as the mean score of eight items tapping different types of law- or rulebreaking behavior (LeBlanc & Tremblay, 1988). Each item was answered on a four-point scale from 0: "never", 1: "on 1 or 2 occasions", 2: "often" to 3: "very often", based on how often the youth had done any of the following over the past 12 months. Delinquent acts included vandalism of public or private property, burglary, carrying of weapons (chain, knife, gun, etc.), being away from home without permission, absence from school, and making anonymous phone calls. Cronbach's alpha was .65.

Substance abuse was measured with the six-item CRAFFT screening test (Knight et al., 1999). Questions were qualified with "the past 12 months", and were answered in a yes/no format, with each yes answer scored as 1. Total scale scores, ranging from 0 to 6, were obtained by summing the number of yes-responses. Items included: "Have you ever ridden in a car driven by someone (including yourself) who was "high" or had been using alcohol or drugs?", "Do you ever use alcohol or drugs to relax, feel better about yourself, or fit in?", "Do you ever forget things you did while using alcohol or drugs?", "Do your family or friends ever tell you that you should cut down on your drinking or drug use?", and "Have you ever gotten into trouble while you were using alcohol or drugs?". The criterion validity of the CRAFFT test has been supported as a means of screening adolescents for substance-related problems and disorders (Knight, Sherritt, Shrier, Harris, & Chang, 2002). Cronbach's alpha was .67.

2.3. Data analyses

2.3.1. Data preparation

For correlations and genetic analyses, mean effects of sex and age was regressed out, and Box-Cox transformation was used to correct for non-normality. Preliminary analyses showed no deviation from the basic assumption of equality of means and variances within twin pairs and across zygosity. Analyses were performed using the open source statistical software package R, version 3.0.1 (R Core Team., 2013). Genetic modeling analyses were performed using the OpenMx version 1.4 (Boker et al., 2011).

2.3.2. Genetic analyses

The twin design compares the similarity between MZ (genetically identical) and DZ (sharing on average 50% of their segregating genes) twin pairs. Relative differences in within-pair correlations allow estimations of the influences of additive genetics, shared environment, and non-shared environment. Quantitative genetic methods are described comprehensively elsewhere (Rijsdijk & Sham, 2002).

Multivariate models were fitted to raw data by full information maximum likelihood estimation using structural equation modeling (SEM). Nested submodels were compared by testing the difference in −2 times log likelihood (Δ−2LL), which is asymptotically chi-square (χ^2) distributed. If the difference in χ^2 is non-significant, the simpler model is preferred over the more highly parameterized and complex model. In addition, Akaike's Information Criterion (AIC; Akaike, 1987) and the sample size adjusted Bayesian Information Criterion (BICadj; Markon & Krueger, 2004) were used to determine model fit of non-nested models.

The main genetic model tested in the present study is commonly referred to as the psychometric or common pathway (CP) model (Rijsdijk & Sham, 2002). This model specifies common genetic, shared environmental, and non-shared environmental factors, as well as unique genetic and environmental factors specific to each phenotype. Rather than loading directly on each measured phenotype, the common effects are mediated through a latent phenotype that represents the variance shared among the measured phenotypes.