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WORKING-PAPER SERIEN

Personality and later criminality

Long-term follow-up of conduct disorder adolescents into young adulthood

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Abstract

Objective: This study focuses on the relationship between Cloninger's personality model and later criminality in a clinical sample of conduct disorder adolescents.

Method: All subjects (n=112) were patients at an in-patient child and adolescent psychiatric unit. Their personality was assessed according to Cloninger's theory. The mean age was 15.5 (sd=1.2) years old when assessed. The average age at follow-up was 20.8 (sd=1.1). At follow-up, the subjects self-declared criminal behaviour.

Results: The sample's personality differed from a normal population at in-take and follow-up. Temperament and character were stable over time, except for novelty seeking. The temperament variable harm avoidance and the character variables cooperativeness and self-directedness affected later mild theft and personal violence.

Conclusion: The subjects showed the expected personality dimensional profile according to Cloninger's theory. In addition, Cloninger's theory significantly predicted criminality.

Keywords

Personality, Conduct disorder, long-term follow-up, clinical sample, and TCI.

Significant Outcomes

- Cloninger's personality dimension profile can help identify severe antisocial adolescents in clinical samples.
- Cloninger's personality model can significantly predict criminal outcomes, but the explained variance is too small to make single individual prognoses.

Limitations

At the in-take, several subjects had considerable educational problems and several had completed fewer grades than other members in their cohort at follow-up [1]. The TCI-238 requires some basic skills in reading, in understanding words, and in understanding meanings of sentences. To minimize the effect of misinterpreting the meaning of the single TCI-238 items, an interviewer was present when the questionnaire was filled in. The interviewer was instructed to be observant and helpful if the subject seemed to have problems with the TCI-238.

Statistical rates of general criminal involvement generally peak at about age 18 for males and about 15 for females [2-4]. However, there are differences in the peak age of offending across offence types and gender [5-11]. This might interfere with correlations over time.

Social desirability could have influenced the study group answers. On the one hand, the TCI-238 is constructed in a way that it is not obvious what answer is socially desirable; on the other hand, the structured interview about criminal behaviour is quite easy as far as being able to identify what a social desirable answer should be.

Sample size (statistical power) affects the generalizability of the results by ratio of observations to independent variables [12]. Hair et al. [12] believes the ratio should never fall below 5:1. That is, five observations are made for each independent variable in the multiple regression variation, but the preferably ratio is at least 15:1. In our study, the ratio is 10:1.

Denna artikel skrevs som en förlängning på den studie som avrapporterades i Martin Olssons avhandling ”Unga vuxna med en historia av uppförande störning” (2007) på Socialhögskolan. Kjell Hansson och Marianne Cederblad initierade studien. Kjell Hansson är fortfarande aktiv som senior professor på Socialhögskolan i Lund och Marianne Cederblad är professor emeritus.

It is an old idea that individuals have different personalities and that personality influences the development of psychiatric health or disease. Hippocrates, for example, had a personality theory, which was the foundation for the perspective of psychiatric disease for centuries. Personality can be defined as an individual’s repertoire of stable, lasting, and predicted behaviours. Cloninger [13] theorized that personality is a combination of hereditary neurobiological stains (temperament) and traits influenced by socio-cultural learning (character). Both temperament and character are important factors that influence later criminal behaviour, at least when based on adoption data [14]. During the years 1995-1998, the psychiatric assessment at the in-patient child and adolescent psychiatric unit in Lund included personality data based on Cloninger’s theory. This study focuses on the relationship between personality during adolescence and criminality in young adulthood. This is the first study that focuses on adolescence personality and later criminality in a psychiatric clinical sample according using Cloninger’s theory of personality. All individuals in the clinical sample were diagnosed with conduct disorder (CD). CD describes a norm breaking condition manifested by aggressive, antisocial, and criminal behaviour.

A dimensional psychobiological model of personality

Cloninger’s dimensional model of personality is based on both temperament and character [15-17]. Temperament refers to basic emotional responses by individuals, such as anger, fear, and disgust. The four temperament dimensions (novelty seeking, harm avoidance, reward dependence, and persistence) are moderately heritable and moderately stable. Character refers to individual differences in values, self-conscious emotions such as shame, guilt, and empathy. The three character dimensions (self-directedness, cooperativeness, and self-transcendence) are weakly heritable and moderately predisposed by social learning and are mature in a stepwise pattern. [15-17].

Cloninger et al. [17] demonstrated a positive significant correlation between novelty seeking and number of CD symptoms. They found a significant negative correlation between reward dependence, self-directedness, and cooperativeness and the number of antisocial symptoms. There were no relations between harm avoidance, persistence, and self-transcendence and the number of antisocial symptoms. This cross-sectional relationship was the same for both childhood and adult-

hood [17]. In clinical samples, the combination of high novelty seeking, low harm avoidance, low reward dependence, and low cooperativeness in childhood are associated with CD symptoms [18, 19]. The subjects are described according to their behaviours:

- high novelty seeking are described as exploratory, impulsive, extravagant, and irritable;
- low harm avoidance are described as optimistic, daring, outgoing, and energetic;
- low reward dependence are described as critical, aloof, detached, and independent; and
- low cooperativeness are described as intolerant, insensitive, hostile, revengeful, and opportunistic [20].

Different temperament configurations relate to different risks of particular behaviours and emotions, such as violence and compassion. The accuracy of predictions about behaviours in single subjects is low unless the character configuration is also specified. For example, the adventurous temperament (i.e., high novelty seeking, low harm avoidance, and low reward dependence) may lead to severe antisocial behaviour when character is immature [20].

To our knowledge, there are two longitudinal studies that have used Cloninger's dimensional model of personality through childhood, adolescence, and adulthood. The first, a study in Montreal, Canada [21], attempted to predict antisocial behaviour in age 10-13 subjects with a temperament of age 6. Tremblay et al. [21] described novelty seeking as the best predictor of stable, highly delinquent behaviour for boys. The second study is a Swedish longitudinal study. Sigvardsson et al. [22] showed that children at age 11 with the a constellation of high novelty seeking, low harm avoidance, and low reward dependence had more delinquent behaviour as adults than children with other constellations. The temperament and character was retrospectively rated and was based on adoption data [22]. The two studies' samples consist of individuals without psychiatric diagnoses.

According to the theory, our clinical sample will show high novelty seeking, low harm avoidance, low reward dependence, and low cooperativeness compared to a normal population. The clinical sample, when admitted to the psychiatric ward and assessed, would be expected to have an adventurous temperament with an immature character. An adventurous temperament would predict antisocial behaviour at least in groups. Therefore, it is expected that novelty seeking, harm avoidance or reward dependence will predict later criminality.

Criminal behaviour

A significant number of all crimes are made by young people. During adolescent, the actual self-reported rates of illegal behaviour are so high that participating in delinquency appears to be a

normal part of teen life [23-26]. In Sweden, more than half of adolescents at age 15 self-report that they have committed some kind of theft, mostly low level theft [24, 25]. Statistical rates of criminal involvement generally peak at about age 18 for males and about 15 for females [2-4]. Here, we will present some theories about age and criminality.

The relationship between age and crime has been the subject of considerable criminological analysis [3]. Blumstein and Cohen [27] argue that that the single-peaked combined age-curve is characteristic of the onset and termination of criminal careers. This has been interpreted as indicating that a significant proportion of young people will eventually end this behaviour [7, 28]. However, there are differences in the peak age of offending across offence types [29-31].

Researchers classify offenders into several typologies. Graham and Bowling [30] showed that expressive offences (e.g., vandalism and arson) is most common in the mid-teens, violent offences (e.g., assault) increase during the teenage years then drops off, and the level of property offences (e.g., shoplifting and burglary) is relatively constant during the teens and then decreases in the early twenties. Yet another way is to classify offending career trajectories in terms of the varying frequency of total offending or behavioural problems over time. Nagin and Land [6] and Nagin et al. [5] identified four distinctive offending trajectories among males: conviction free, adolescence limited, high-level chronics, and low-level chronics.

Moffitt's theory is probably the most adequate theory to use in our context because of its longitudinal approach and focus on stability. Explaining the stability of behavioural problems, Moffitt [7, 8] identified two types: adolescent-limited (AL) and life-course persistent (LCP) antisocial behaviour. According to the findings, the AL and LCP individuals tend to engage in different patterns of offending. AL individuals engage in proportionally more crimes that symbolize adult privilege or that demonstrate autonomy from adult control: vandalism, public order offences, and substance use, and "status" crimes such as running away from home and theft. LCP individuals participate in a wider variety of offences and commit proportionally more of the victim-oriented offences, such as violence and fraud.

The LCP child's CD symptoms start early in life, before puberty, and emerge from inherited or acquired individual neuropsychological risk factor, such as subtle cognitive deficits or hyperactivity that interacts with environmental risk factors, such as inadequate parenting, disruptive family bond, and poverty [7, 8]. In our sample, the majority of patients could most certainly be described as having a history similar to the LCP child. More recent work has investigated whether separate criminal

trajectories exist for violent or non-violent crime [9]; these studies found that violent crime predicts stability in offending [10]. Moffitt [32] also put forward a third group of “low-level chronic offenders”, and points out that this group closely resembles the low-level chronics first identified by Nagin et al. [5].

Earlier studies have shown that criminality is a moderate stable factor over time in a clinical sample consisting of adolescence with conduct disorder [33-37]. The choice of the outcome variable measuring criminal behaviour should consider that different crimes seem to occur at different ages. When constructing a prediction model, it is impossible to predict an outcome that will vanish within the prediction model’s time span. Therefore, we divided criminal behaviour into five conceptual categories (youth-related offences, mild theft, moderate theft, personal violence, and vandalism) based on earlier categorisations, when we have used them as outcomes. Two of our categories – youth-related offences and vandalism – would most probably have vanished in young adulthood in a normal population; however, the three other categories – mild theft, moderate theft, and personal violence – could still be present in young adulthood. In a clinical sample consisting of LCP children, personal violence would be present and possible to predict.

Aim

This study focuses on the relationship between Cloninger’s dimensional model of personality and later criminal behaviour in a clinical sample consisting of adolescents with conduct disorder.

Method

Subjects

All subjects in this clinical sample were patients at the in-patient child and adolescent psychiatric unit in Lund. From 1985 through 1998, there were several changes in the data collection because new clinical and research knowledge became available at the Department of Child and Adolescent Psychiatry, Lund University [38]. This research facility inspired the in-patient unit to use several standardised measurements in their assessment. From 1995, more standardised and structural measurements were used. These measurements were used at the assessment between 1995 and 1998.

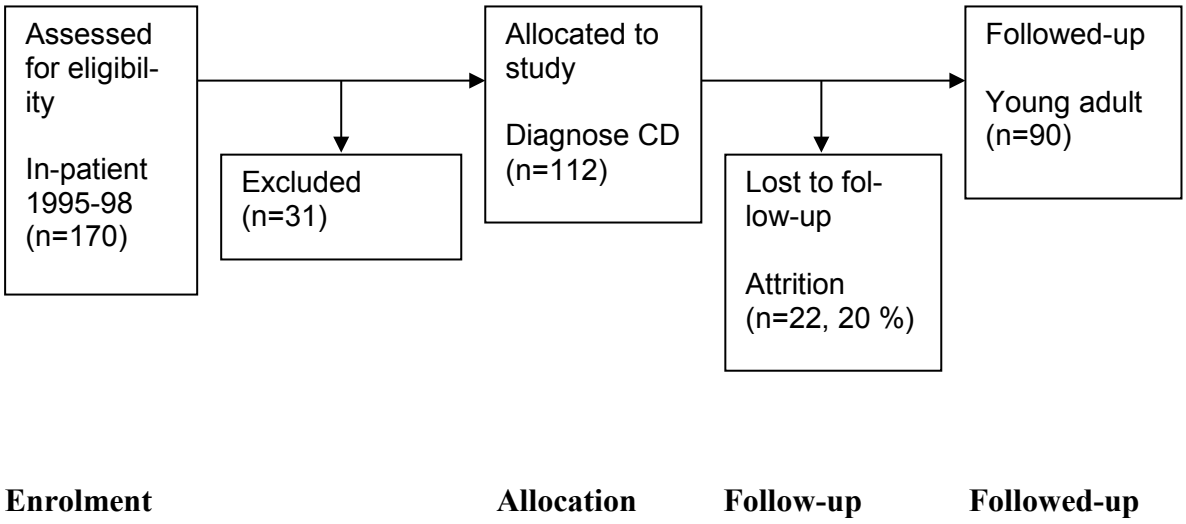

Figure 1. Flow diagram of the progress through the phases of the study.

The enrolment took place at the in-patient child and adolescent psychiatric unit in Lund between 1995 and 1998 (Figure 1). Before the enrolment, a patient was referred by a social service agency or came voluntarily to an outpatient child psychiatric unit for antisocial behaviour problems. If the outpatient staff deemed the severity of the problem significant enough, they conducted a more thorough assessment. Then the patient was referred to the in-patient unit. Admittance was realized after a joint meeting with the patient, the patient's family, the social service agency, and the psychiatric staff. Between 1995 and 1998, 170 patients underwent assessment at the in-patient unit for at least four weeks. Patients were excluded if they were not diagnosed with CD (n=31). This study used in-patients diagnosed with CD (n=112). A psychiatrist made the diagnosis according to DSM-IV-TR [39] using the medical case record or assessment. The psychiatrist did not code the diagnosis based on age at onset. An independent psychiatrist made a re-diagnosis with 100% agreement [1]. The mean age was 15.5 (sd=1.2) years old when admitted to the in-patient psychiatric unit.

The clinic planned to follow-up routinely the subjects to gain knowledge about their adjustment in early adulthood. The psychiatrist informed the patients of the planned follow-up in adulthood and noted whether they accepted to participate. At follow-up, the subject had to be at least 20 years old and at least five years had to have past since they were patients at the in-patients unit. A letter was first sent to the former patient asking them to make contact with an interviewer. If no contact was made, the interviewer attempted to contact them by telephone. The subjects were sometimes of-

fered money if they participated. At the follow-up, some former patients were lost due to external attrition (n=22). In all, 90 patients of the 112 were followed-up as young adults. The average age at follow-up was 20.8 (sd=1.1). The average follow-up time was 5.7 years (sd=0.8).

Measurement

The chosen measurements were used at the psychiatric assessment because they were used or were to be used in other Swedish studies.

Temperament and Character Inventory (TCI-238) consists of 238 true or false statements about temperament and character from the psychobiological model [17]. The temperament statements are divided into the dimensions novelty seeking, harm avoidance, reward dependence, and persistence. The character statements included self-directedness, cooperativeness, and self-transcendence. Cloninger et al. [15] found Cronbach's alpha to be 0.76-0.87 for the temperament scales and 0.84-0.89 for the character scales. In 1995-1998, the adult version of TCI was used, because the Junior Temperament and Character scale was not in use in Sweden.

In addition, a self-declared antisocial behaviour interview, developed by BRÅ (Brottförebyggande rådet, National Council for Crime Prevention), was used. Ring [25] describes this instrument in detail; however, we used an earlier version of the interview. Table 1 lists parts of the interview and how we adapted the interview into five crime categories.

Table 1. Account of the combination of questions made to obtain crime categories.

Category	Questions.
Youth-related offences	"Have you ever stolen a ride on a bus or train?" or "Have you ever driven a car, motorcycle, or moped without a licence or insurance?"
Mild theft	"Have you ever pinched or stolen things from a shop", "…stolen anything from school", "…stolen anything at home or the place where you live", or "…stolen anything at the place where you work?"
Moderate theft	"Have you ever stolen money from a payphone or a product box", "… stolen a bike", "…broken an entrance or sneaked in a house or building (i.e., not empty or abandoned)", "… stolen a moped or MC", "…stolen a private car", "…stolen anything from a car", "…snatched someone's wallet, bag, etc.", or "…stolen anything that I haven't mentioned here?"
Personal violence	"Have you ever threatened anyone with a weapon or with violence to get hold of money or other valuables", " beaten a person that didn't belong to your family so that this person had to seek medical care", " beaten a person that did belong to your family so that this person had to seek medical care", "hurt anyone with a knife, stiletto, or any weapon?"

Vandalism	"Have you ever damaged or destroyed a bus shed (wind shed) at a bus stop", "a traffic sign", "a telephone box", "a window", "a (public) litterbin", "a streetlight", "school furniture", "trees, plants, or flowers in park or public place", "a seat in a bus, local train, or train (distant-train)", "a private car", "someone's bike", "someone's MC (or moped)", "anything else that belonged to someone else?", "Have you ever made graffiti, in other words, written or sprayed on walls, buses, at bus-stops, etc?" or "Have you ever intentionally lighted a fire to burn a barn, a car, a forest, a cellar, a building or anything else that didn't belong to you?"

If the subject said yes to any of these questions, they were asked about the frequency during the year: "How often have you done this in the previous year?" If the subject answered 1 time or several times, this was noted as a criminal activity during the last 12 months. One subject could be noted with more than one criminal category.

Due to internal attrition – i.e., subjects who did not answer all questions – 21 subject at the in-take and seven subjects at the follow-up were lost in some of the statistical analyses (n=83-91). Some subjects answered all questions at one occasion, but not at the other, which has also given variation in number of subjects (n=72-83). Therefore, the number of subjects is presented in every statistical analysis.

Statistical method

To summarise and compare the results, correlations, means, standard deviations, *t*-test, and logistic regression were used. Cohen [40] has suggested that an absolute number between 0.1-0.3 indicates a small correlation, 0.3-0.5 indicates a medium correlation, and 0.5-1.0 indicates a large correlation. Logistic regression predicts and explains a binary (two-group) categorical variable [12]. The logistic regression variation represents a single multivariate relationship with regression-like coefficients indicating the relative impact of each independent variable in the regression model. The statistic analyses were made using SPSS 15 software.

Result

First, we compared our clinical study group with a comparison group (Table 2) to find out if our sample had low/high constellation according to the theory. The best comparison group we could find was described as a normal population by Brändström et al. [41]. Second, we calculated correlations to examine the personality dimensions' stability over time. Third, we calculated phi coefficients to examine the stability of criminal behaviour over time. Fourth, we compared temperament and character dimensions with later criminal behaviour (Table 3).

Table 2. Comparison between normal population and study group at in-take and follow-up.

	Normal population[1] n=400	In-take n=91	Follow-up n=90
Temperament	M (sd)	M (sd)	M (sd)
Novelty seeking	21.9 (6.0)	24.3 (5.3)***	24.5 (5.3)***
Harm avoidance	13.4 (6.3)	15.9 (6.5)***	15.2 (7.5)*
Reward dependence	15.3 (3.8)	12.5 (4.0)***	13.7 (3.8)***
Persistence	4.2 (2.0)	3.3 (2.0)***	4.2 (1.9)^{ns}
Character			
Self-directedness	31.1 (6.9)	22.5 (7.9)***	26.8 (9.2)***
Cooperativeness	33.1 (5.2)	25.0 (7.5)***	28.2 (6.9)***
Self-transcendence	11.7 (5.4)	17.0 (6.6)***	14.7 (6.8)***

t-test. , ns=non significant, *=p<.05; **=p<.01; ***=p<.001 1. Ref. Brändström et al. [41], 20-35 years.

At in-take and follow-up, the study group had both significantly higher novelty seeking and significantly lower reward dependence than the normal population. We also found that the study group had significantly higher harm avoidance at both in-take and follow-up compared to the normal population. The result also showed that the study group both at in-take and follow-up had significantly lower self-directedness and cooperativeness than the normal population.

The TCI-238 subscales showed all significant correlations from in-take to follow-up with the exception of Novelty seeking (n=72, Novelty seeking r=.05^{ns}; Harm avoidance r=.42***; Reward dependence r=.46***; Persistence r=.31**; Self-directedness r=29*, Cooperativeness r=.42***; Self-transcendence r=.38**). The significant correlations were all medium strong with the exception of Self-directedness (small). The Crime-categories showed both significant and non-significant relations from in-take to follow-up (n=83, Youth-related offences phi=.35**; Mild theft phi=.13^{ns}; Moderate theft phi=.28*; Personal violence phi=.25*; Vandalism=.15^{ns}). The frequency of self-reported

criminal behaviour at follow-up varied between 12 – 42 % (n=72) in the five categories. Most frequent were youth-related offences (42 %), followed by vandalism (29 %), and mild theft (24 %). Least frequent were personal violence (12 %) and moderate theft (17 %).

Table 3. The relationship between temperament at in-take and criminal behaviour at follow-up (n=72).

	Dependent variable														
	Youth-related offence			**Mild theft**			**Moderate theft**			**Personal violence**			**Vandalism**		
Independent variables	B	SE B	Wald	B	SE B	Wald	B	SE B	Wald	B	SE B	Wald	B	SE B	Wald
Temperament															
Novelty seeking	-.01	.06	$.07^{ns}$	-.13	.08	$2.77^{\dagger}$	-.01	.07	$.01^{ns}$	-.12	.11	1.12^{ns}	-.01	.06	$.02^{ns}$
Harm avoidance	-.09	.06	2.53^{ns}	-.15	.07	3.83*	-.20	.08	5.49*	-.19	.11	$3.03^{\dagger}$	-.04	.06	$.56^{ns}$
Reward dependence	-.00	.09	$.00^{ns}$	.14	.12	1.28^{ns}	.02	.12	$.03^{ns}$	.29	.20	2.12^{ns}	-.08	.09	$.79^{ns}$
Persistence	.20	.16	1.57^{ns}	.00	.20	$.00^{ns}$	.35	.24	2.17^{ns}	.64	.39	$2.71^{\dagger}$	-.04	.17	$.06^{ns}$
Character															
Self-directedness	-.11	.05	5.20*	-.14	.07	4.71*	-.17	.07	5.48*	-.18	.10	$3.04^{\dagger}$	-.06	.05	1.45^{ns}
Cooperativeness	.04	.05	$.06^{ns}$	-.14	.07	3.72*	-.04	.07	$.30^{ns}$	-.37	.15	6.28*	-.02	.05	$.10^{ns}$
Self-transcendence	-.06	.05	1.43^{ns}	.00	.06	$.00^{ns}$	-.02	.07	$.11^{ns}$	.09	.09	1.06^{ns}	-.01	.05	$.06^{ns}$
R^2	**$.10^{ns}$**			**.21***			**$.15^{ns}$**			**.26****			**$.08^{ns}$**		

Note. ns=non-significant. , †=p<.10, *=p<.05, **=p<.01

The logistic regression model showed a significant logistic regression models for mild theft and personal violence (Table 3), but for youth-related offences, moderate theft, and vandalism the model showed no significant result. In the significant logistic model with the outcome variable mild theft, there were three significant independent variables. Together the independent variables harm avoidance, self-directedness, and cooperativeness explained about a fifth of the variance (Cox & Snell R^2) in mild theft. High harm avoidance, high self-directedness, and high cooperativeness at in-take decreased the risk of later mild theft. In the significant logistic model with the outcome variable personal violence, the character variable cooperativeness was the only significant independent variable and explained about a fourth of the variance (Cox & Snell R^2). High cooperativeness at in-take decreased the risk of later personal violence.

Discussion

The results showed that the sample's personality differed from a normal population both at in-take and follow-up. Temperament and character were stable over time with the exception of novelty seeking. The temperament variable harm avoidance and the character variables cooperativeness and self-directedness seemed to have a later effect for mild theft and personal violence.

According to the Cloninger's theory, there should be differences between a group of adolescents diagnosed with CD and a normal population. Among the adolescents with CD, the personality dimensions should be profiled as high novelty seeking, low harm avoidance, low reward dependence, and low cooperativeness compared to a normal population. Our study found empirical support, both at in-take and follow-up, for high novelty seeking, low reward dependence, and low cooperativeness, but the harm avoidance was higher in comparison. High harm avoidance is the opposite result than the expected low harm avoidance. High harm avoidance described subjects as pessimistic, fearful, shy, and fatigable [20]. The features of high harm avoidance are similar to symptoms of anxiety or depression. Our result could be due to our clinical sample. The high comorbidity between CD and mood/anxiety disorders is known [42]. Earlier studies of similar groups have shown significant correlations between internalising and externalising behaviour. This study group had a significant correlation between externalising and internalising behavioural problems among the subjects at in-take (Youth Self-Report Scale, YSR [43], $r=.43$ $p<.01$, $n=102$). Furthermore, at in-take this study group also had a significant correlation between harm avoidance

(TCI-238) and anxiety/depression (YSR) (r=.59, p<.001, n=88). These inconsistencies could mean that the sample at in-take did not consist of subjects with “pure” CD symptoms.

At follow-up, the profile from in-take remained (high novelty seeking, low reward dependence and low cooperativeness, and high harm avoidance). This is probably due to stability. In an earlier study of the outcome of this sample [1], we found that at least 55% of the sample had a negative outcome at follow-up. CD is considered to be a moderately stable condition [42]. This suggests that several former patients still had CD symptoms at follow-up.

In Cloninger’s psychobiological theory of personality, temperaments are considered moderately heritable and stable. All TCI-238 temperament scales showed significant correlations over time with the exception of novelty seeking. This could be because the teenagers devoted themselves to novelty seeking during their teens. Therefore, the adolescents’ answers to the TCI-238 during the in-take period could be influenced by social desirability. This explanation also corresponds with a feature of Moffitt’s theory [7, 8] explaining the stability in behavioural problems. According to Moffitt, the LCP adolescent’s CD symptoms start early in life, before puberty, and will produce life-course persistent CD symptoms. The AL adolescent’s CD symptoms will decrease when entering adulthood [7, 8]. In this study, the sample cannot be described as a “pure” LCP sample. According to the anamnesis described in the medical casebook, 76% of the patients had an onset of CD symptoms be fore age 12 based on school reports (n=112). Fergusson et al. [44] conceptualised antisocial behaviour as a continuum with AL at one extreme and LCP at the other, with considerable blurring in the middle. AL subjects are supposed to find the LCP subject’s behaviour as socially desirable and mimic the LCP behaviour. If the most apparent or easy to adapt behaviour among LCP subject is similar to what Cloninger is describing as novelty seeking, the novelty seeking behaviour among the AL subjects in the sample would not be stable over time. This could explain why there were no significant correlations in novelty seeking over time.

Among the crime categories, there were significant relations between similar criminal behaviour at in-take and follow-up, except for mild theft and vandalism. Several criminology studies have shown that different crime categories are more evident at different ages [11, 29-31, 45, 46]. For example, the prevalence of vandalism at in-take was much higher than the prevalence of vandalism at follow-up (68% vs. 24%). It could be that vandalism is a crime that is more common in adolescences. If there is a blurring in our sample, this corresponds with some aspects of Moffitt’s theory. AL subjects should engage in crimes, such as vandalism, that symbolize adult privilege or that demon-

strate autonomy from adult control [7, 8]. Vandalism could be one type of crime that AL subjects stop committing during early adulthood even if they had severe CD.

According to Cloninger's earlier results and theory, the temperament dimensions should be the best predictors because of their stability over time. To our surprise, we found that the character dimensions were equally good or better as predictors. In our sample, the environmental social learning context could influence the character stability. Although, in theory, temperament should be more heritable than character, research has shown that character also is influenced by heritage [47]. From this perspective, our result is not surprising.

The independent variables significantly contributed to the outcome variable in the significant logistic models were harm avoidance, self-directedness, and cooperativeness. If the character dimensions in the Cloninger theory are moderately predisposed by social learning [15-17], it is possible that the parental or other environmental influence could form the adolescent character positively and thereby decrease the risk of future criminal behaviour. In this sample, the subject scored significantly lower on these character variables than a normal population at the in-take. High scores on these dimensions decreased the risk of the outcome. Therefore, if clinicians work to enhance a subject's character to be more responsible, purposeful, resourceful, self-accepting, and disciplined, the clinicians are forming the patient's character to be described as high self-directedness [20]. High cooperativeness is characterised by an individual described as tender-hearted, empathic, helpful, compassionate, and principle.

Cloninger [20] points out the impotence of both temperament and character configuration when predicting a single subjects' later antisocial behaviour. Our study showed that in a homogenous sample of adolescents diagnosed with CD, it was character rather than temperament that could give significant variance in the criminal outcome variable. The best significant explained variance at the group level was 26%. This is far from being substantial enough to make predictions about a single subject based on the TCI-238 questionnaire.

We could not find significant prediction models for the outcome variables youth-relation offences and vandalism. Youth-relation offences and vandalism are criminal behaviours that in a normal population are more frequent in the teenage group and seem to diminish over time. When choosing an outcome variable in a prediction study, it is not suitable to choose an outcome variable that does not exist over time. However, we have done so. Youth-related offences and vandalism were in young adulthood the most frequent self-reported criminal behaviour in the sample. Our sample

consists of a selective sample and it is not certain whether the development of crime in a selective sample is comparable with the crime development in a normal population.

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