Keywords: Adolescence; High-risk; Conduct disorder; Emotional deficits; Cognitive deficits.

Profile of male adolescents with conduct disorder on intellectual efficacy, cognitive flexibility, cognitive coping, impulsivity and alexithymia: A comparison with high-risk controls

S. Pihet
M. Suter
O. Halfon
P. Stephan

Service Universitaire de Psychiatrie
de l'Enfant et de l'Adolescent,
Unité de Recherche
Lausanne

SWITZERLAND

ABSTRACT – Background and Objectives: To specify which of the documented cognitive and emotional deficits characterize adolescents with conduct disorder (CD) compared with high-risk controls.

Methods: High-risk adolescent males with and without CD were compared on intellectual efficiency, cognitive flexibility, impulsivity, alexithymia, and cognitive coping strategies. Substance use was controlled for in analyses.

Results: Both groups showed normal intellectual efficiency and cognitive flexibility, as well as heightened alexithymia and behavioral impulsivity. Youths with CD evidenced more self-defeating and black-and-white thinking under stress, and more acting-out under negative affect, than those without CD.

Conclusions: Deficits specific to CD resided in facets of emotional functioning and cognitive coping that might be targeted by a coping skills intervention.

Received: 16 March 2011

Revised: 5 April 2012

Accepted: 31 May 2012

Background and objectives

Conduct disorder (CD) is one of the most common mental disorders in juvenile offenders¹, and may thus be an important target for the application of Juvenile Court Acts, for example the Swiss and German ones, which put a strong emphasis on education and treatment in response to juvenile delinquency. In this perspective, skills training programs represent cost-effective interventions that could be implemented in facilities accommodating juvenile offenders. However, the currently available evidence-based programs, which mostly focus on social skills, are scarce and have demonstrated limited efficacy^{2,3}. The emotional or cognitive deficits that have been shown to be associated with offending or CD^{4,5} could be good candidates for alternative or additional skills training programs. Yet to date most studies identifying them compared extreme groups, i.e. CD diagnosed adolescents or incarcerated juvenile offenders with pupils of the regular school curriculum, without controlling for important confounding factors such as comorbid mental disorders, and particularly substance use disorders. Some of the differences we will review might thus be overestimated.

One century of research has repeatedly established the existence of a negative relationship between IQ and offending or CD, but only in the past decades has extensive examination suggested it to hold only for verbal IQ⁶. Given the typically low level of academic achievement of delinquent youths, this finding could be partly explained by their lack of exposure to the kind of information assessed by verbal IQ tests⁷. Measures of intelligence unrelated to education (e.g. non verbal intelligence), or culture-free tests, might thus fit better this population. More so as research using them found no differences between youths with and without CD^{8,9}.

Findings from extensive scientific research focusing on executive functions, suggest that two types of dysfunctions are strongly involved in delinquency. Firstly, deficits in cognitive flexibility¹⁰, in particular the ability to shift cognitive set according to changing contingencies, have been described using the Wisconsin Card Sorting Test¹¹: adolescents with CD seem to perform more poorly than community controls^{5,12}, although some found them to perform equally well¹³. Secondly, deficits in inhibition are well documented¹⁴⁻¹⁶, in particular in some aspects of behavioral inhibition, such as the ability to refrain from responding before the stimulus is fully processed, as measured by the behavioral task of Immediate and Delayed Memory, IMT/DMT¹⁷: this type of impulsive behavioral response was observed more frequently in adolescents with disruptive behavior^{18,19} or with CD^{20,21}, compared with community adolescents.

Impairments in emotional regulation also appear to play an important role in delinquent behavior. Apart from the executive function research approach mentioned above, impulsivity has also been extensively investigated in offenders as a personality trait^{22,23}, using questionnaire measures. Higher levels of trait impulsivity were consistently observed in adolescent offenders^{6,24} or with CD²⁵ compared to adolescents from the general population. Nevertheless, using more differentiated measures of trait impulsivity such as the UPPS scale²⁶, externalizing problems were found to be associated with only some of the four investigated dimensions²⁷.

Another important concept related to emotional regulation, though more scarcely investigated, is alexithymia, meaning the inability to recognize and describe feelings, and an externally oriented way of thinking²⁸. Higher levels of alexithymia have been documented in male adolescent offenders, compared to community adolescents^{29,30}. However, these results remain to be replicated in adolescents with CD.

Constructive thinking is yet another promising concept, covering the use of functional cognitive coping styles in stressful situations³¹: adolescent girls with CD reported to use less constructive and more destructive coping strategies than their counterparts from the general population³². However, this result has not yet been replicated in boys.

Although the literature reviewed has shed light on features of cognitive and emotional functioning that might characterize adolescent offenders and, in some cases, adolescents with CD, they share a number of methodological shortcomings. Firstly, most of the studies have used control groups consisting of community adolescents, recognized as presenting, among other potentially confounding factors, a much lower prevalence of psychiatric disorders (particularly substance use disorders)^{1,33}. The latter were often not controlled for in analyses, and might be responsible for part or all of the observed differences between the two groups. Secondly, cognitive and emotional deficits have predominantly been studied separately, despite a growing body of evidence underlining their interdependence^{34,35}.

The present study thus aimed at assessing simultaneously the reviewed cognitive and emotional deficits, comparing male adolescents with CD to high-risk adolescents presenting similar rates of other psychiatric disorders, and controlling for problematic substance use in all analyses. We expected some of the documented differences not to be replicated in this more stringent design.

Methods

Participants

Adolescent males aged 12 to 18 years were recruited in three leisure centers, two foster care units and two institutions for juvenile

offenders, with exclusion criteria of lifetime presence of psychotic disorders, mental retardation, and insufficient French language skills. The sample is composed of 78 youths, 39 scoring above the clinical cut-off on the Pedersen questionnaire for CD (see "Measures"), constituting the CD group ($M = 4.90 \pm 1.99$), and 39 scoring below the cut-off, constituting the non-CD group ($M = 0.85 \pm 0.87$, $d = 2.82$; i.e. the difference in frequency of delinquent behavior between the two groups is very large). In the CD and non CD groups, respectively 10 and 40% of the youths were recruited from the leisure centers, 87 and 58% from institutions for juvenile offenders and 3 and 2% from foster care units. The two groups did not differ significantly on most socio-demographic variables and on psychiatric comorbidity rates (see Table 1).

Measures

Conduct disorder. The 17-item self-report questionnaire of Pedersen assesses delinquent behaviors closely related to criteria for CD in DSM-III-R; its psychometric properties are well established³⁶. This measure was chosen for its focus on delinquent behaviors that could be planned or impulsive in nature, ensuring its full independence from the self-report measures of impulsivity. Answers are given on a 6-point scale based on the frequency of the delinquent behavior during the previous 12 months: 1 = never, 2 = once, 3 = 2 to 5 times, 4 = 6 to 10 times, 5 = 11 to 50 times and 6 = more than 50 times. Items range from common adolescent behaviors considered problematic only when high in frequency to serious ones that are problematic even when infrequent, for which different cut-off have been proposed according to their severity³⁷. The cut-off point is 6 (more than 50 times) for items investigating minor problem behavior (e.g. "sneaked into bus, train, cinema, etc. without paying"), 5 (11

Table 1
Socio-demographic information and comorbidity rates of the sample

	non-CD (N = 39)	CD (N = 39)	Test	Sig
	M $\pm$ SD or %	M $\pm$ SD or %		
Age	15.71 $\pm$ 1.21	16.12 $\pm$ 1.43	t = -1.35	.179
Migrants	43.6	56.4	$\chi^2 = 8.77$	.643
School dropouts	17.9	46.3	$\chi^2 = 10.55$	.032
Intact families	46.2	30.1	$\chi^2 = 10.90$	.207
Biological parents	97.4	92.7	$\chi^2 = .32$	.571
Living with both parents/one parent/foster care (life)	53.9/43.7/2.6	34.2/60.9/2.4	$\chi^2 = 9.58$	.295
Living with (see above, current year)	43.6/36.0/15.4	17.0/46.4/26.8	$\chi^2 = 11.59$	.237
Father unemployment	7.7	12.2	$\chi^2 = 10.22$	.421
Mother unemployment	23.1	22.0	$\chi^2 = 9.57$	.479
Depression (current year)	12.8	23.1	$\chi^2 = 1.14$	.285
Depression (lifetime)	46.2	64.9	$\chi^2 = 2.69$	.101
Suicide attempts	17.9	15.4	$\chi^2 = 0.09$	.761
Self-injury	28.2	23.1	$\chi^2 = 0.35$	.557
Alcohol (dependency)	35.0	50.0	$\chi^2 = 1.69$	.188
Illegal substances (dependency)	60.0	74.3	$\chi^2 = 1.38$	.189

times or more) for items investigating moderate problem behavior (e.g. “stolen money or objects from someone in your family”), and 3 (2 times or more) for items investigating serious problem behavior (e.g. “stolen a car or a motorcycle”). Consistent with DSM criteria and previous validation of this strategy in a sample of over 10,000 community adolescents³⁷, our CD group consisted of participants scoring at or above the mentioned cut-off on three or more items. In the present sample, this questionnaire’s Cronbach α is .86.

Substance Use Disorder (SUD). For control purposes, we used the severity index of the Dep-Ado^{38,39}, a screening interview evaluating the problematic use of alcohol and other substances, over the last 12 months. Its French version⁴⁰ has a sensitivity of 95.1% and a specificity of 68.9% when compared with the M.I.N.I.⁴¹.

Non verbal intellectual efficiency. The Raven Progressive Matrices⁴² comprises 60 problems of increasing complexity. Its total score varies between 0 and 60. Scores under 30 indicate intellectual deficiency. This scale has shown high internal consistency, and acceptable to excellent convergent validity (r s between .54 and .86) with other measures of intelligence in children and adolescents⁴².

Cognitive flexibility. The Wisconsin Card Sorting Test (WCST) was developed to measure abstract reasoning and cognitive flexibility¹¹. The total number of errors was used to control that participants understood the task, and the number of perseverative error to assess the ability to shift cognitive set according to changing contingencies⁴³.

Behavioral impulsivity. The Immediate Memory Task and Delayed Memory Task,

IMT/DMT¹⁷, is a computerized Continuous Performance Task measuring attention, memory, and impulsive response style. The ratio of commission errors to correct detections is considered the primary measure of deficits in behavioral inhibition, particularly the ability to refrain from responding before the stimulus is fully processed, with the advantage of correcting for individual differences in attention or general performance⁴⁴.

Trait impulsivity. The UPPS Impulsive Behavior Scale²⁶ is a 45-item self-report questionnaire, assessing four distinct but related dimensions of impulsivity: Urgency, (lack of) Premeditation, (lack of) Perseverance, and Sensation Seeking. Answers are rated on a 4-point scale ranging from 1 = total disagreement to 4 = total agreement. Its French adaptation has demonstrated good internal consistency with α in the .80 range⁴⁵, which was confirmed in our sample (α from .76 to .78).

Alexithymia. The Toronto Alexithymia Scale, TAS-20⁴⁶ is a 20-item self-report questionnaire. Responses are given on a 5-point scale ranging from 1 = complete disagreement to 5 = complete agreement. It comprises three subscales: Difficulty identifying feelings, Difficulty describing feelings, and Externally oriented thinking. Scores above 56 reflect alexithymia, those under 44 reflect its absence⁴⁷. The French version has satisfactory psychometric properties, with α above .70⁴⁸. In the present sample, internal consistency was acceptable for Difficulty identifying feelings (α = .70.) and Difficulty describing feelings (α = .62), but low for Externally oriented thinking (α = .32).

Constructive Thinking. The Constructive Thinking Inventory, CTI³¹ is a 108-item self-report questionnaire describing cognitive strategies used to handle daily-life problems³¹. It comprises one global scale (Global Constructive Thinking), and six specific

scales: two constructive (Emotional Coping, Behavioral Coping) and four destructive ones (Personal Superstitious Thinking, Categorical Thinking, Esoteric Thinking, Naive Optimism). The French version has shown a good internal consistency, with α s ranging from .70 to .88⁴⁹ which was confirmed in the present sample (α s from .62 to .80).

Psychiatric comorbidity. The French short version of the Mini International Neuropsychiatric Interview, M.I.N.I.⁴¹, a structured diagnostic interview for the standardized investigation of Axis I diagnosis of DSM-IV⁵⁰, was used to assess mood disorders (depression), substance/alcohol abuse and dependency, self-injury and suicide attempts. It has good psychometric properties⁵¹.

Procedure

Formal permission was obtained from the recruitment centers and the Juvenile Court, which holds the legal responsibility for the adolescents accommodated by institutions for juvenile offenders. Written informed consent was obtained from each participant after providing them with a complete description of the study. The confidentiality of answers was guaranteed. Data were collected by a trained psychologist during a single individual session of about two hours. Data collection took place in the institutions for juvenile offenders for youths recruited there, and in the Research Unit for other youths, who were reimbursed for their travel expenses and received a 50 CHF voucher for their participation. Approval was obtained from the ethics committee.

Data analysis

Two MANCOVAs, with CD versus non-CD as a two-level between factor, and substance use problems (Dep-Ado severity

index) as a covariate, were carried out on 1) the total and 2) the subscale scores of the CTI, the TAS-20, the UPPS, the WCST, the IMT/DMT and the Raven. Relations between the cognitive and emotional variables were explored using partial correlations, controlling for group (CD versus non-CD) and substance use problems.

Results

Total scores

Regarding the *total scores** for the Raven Progressive Matrices, the WCST, the IMT/DMT ratios, the TAS-20 and the CTI, no significant difference emerged between the CD and non-CD groups ($F_{(7,65)} = 1.26, p = .282$; see Table 2). Results remained identical when further controlling for depression. In comparison with normative values, both groups scored in the normal range on the Raven Progressive Matrices⁴² and on the WCST¹¹, but demonstrated higher levels of behavioral impulsivity¹⁸, speaking for a normal non verbal

intellectual efficacy and cognitive flexibility, but a decreased behavioral inhibition independent of CD. High levels of alexithymia were further observed in both groups: their means were above the clinical cut-off of 56, with 66.7% and 56.4% of the youths scoring above the clinical cut-off in the CD and non-CD groups, respectively. Both groups also scored relatively low on Global Constructive Thinking⁴⁹, indicative of a slightly dysfunctional cognitive coping in our sample, unrelated to CD.

To explore finer-grained differences, a MANCOVA was further performed on the six specific scales of the CTI, the four dimensions of the UPPS and the three subscales of the TAS-20. Its results pointed to significant and substantial differences between the CD and non-CD groups ($F_{(13,63)} = 2.61, p = .006, \eta^2_{\text{partial}} = .35$), with 35% of the variance explained by the group differences, which corresponds to a large effect. Subsequent univariate analyses revealed significant differences for some specific scales of the CTI and UPPS, but no significant differences for the three subscales of the TAS-20.

Table 2
Differences between the CD and non-CD groups on the total scores

	non-CD (N = 39)		CD (N = 39)		$F_{(1,71)}$	Sig
	M	SD	M	SD		
Intellectual efficiency (Raven)	41.32	8.38	45.36	6.37	2.51	.118
Global Constructive Thinking (CTI)	94.63	9.50	91.86	11.44	0.35	.554
Alexithymia (TAS-20)	56.95	10.20	58.73	9.47	0.37	.543
Number of errors (WSCT)	34.21	20.88	25.08	15.81	2.94	.091
Number of perseverative errors (WSCT)	14.95	9.92	11.56	9.26	1.16	.286
IMT ratio	0.56	0.13	0.58	0.19	0.38	.538
DMT ratio	0.58	0.22	0.63	0.31	0.40	.529

* The UPPS was not included in this analysis because no total score can be derived from it.

Constructive Thinking

Significant effects emerged for two of the six specific scales of the CTI (see Table 3): youths with CD scored higher than their non-CD counterparts on Personal Superstitious Thinking and Categorical Thinking, while the groups did not differ on the four other specific scales. Adolescents with CD reported a less flexible thinking style in stressful situations (such as “I tend to classify people as either for me or against me”), for which group membership explained 17% of the variance. They further appeared more inclined to think in a magical pessimistic or self-defeating way (such as “if something good happens to me, something bad will follow”), group membership explaining 9% of the variance. Again, results remained identical after controlling for depression.

Partial correlation controlling for group differences and substance problematic use

showed these two cognitive coping styles were associated ($pr = .38, p = .001$), and both correlated positively with alexithymia scores (for Personal Superstitious Thinking: $pr = .44, p < .001$ and for Categorical Thinking: $pr = .28, p = .018$). Categorical Thinking was further related to increased perseverative errors on the WCST ($pr = .35, p = .005$), suggesting it reflects a combination of cognitive and emotional features.

Impulsivity

Regarding the four dimensions of the UPPS (see Table 3), adolescents with CD scored significantly higher than non-CD youths on Urgency, indicating for the former a stronger tendency to act-out when confronted with negative affects. Group membership explained 9% of the variance. This result remained identical after controlling for depression. Urgency was further found to be

Table 3
Differences between the CD and non-CD groups on the specific scales of the CTI (1-6) and UPPS (7-10) and TAS-20 (11-13)

	non-CD (N = 39)		CD (N = 39)		F _(1,75)	Sig	η^2_{partial}
	M	SD	M	SD			
1. Emotional Coping	81.56	10.79	78.26	13.76	0.11	.741	0.00
2. Behavioral Coping	46.67	7.33	47.00	6.30	0.15	.698	0.00
3. Personal Superstitious Thinking	18.82	5.16	22.26	5.26	7.68	.007	0.09
4. Categorical Thinking	45.56	7.09	51.33	7.87	14.81	<0.001	0.17
5. Esoteric Thinking	29.15	7.44	30.08	10.78	0.05	.817	0.00
6. Naive Optimism	48.26	11.36	47.28	8.66	0.45	.833	0.00
7. (Lack) of Premeditation	25.12	5.37	26.54	5.25	1.02	.317	0.01
8. Sensation Seeking	38.03	5.34	37.10	6.13	1.77	.187	0.02
9. Urgency	31.12	5.08	35.62	5.26	7.36	.008	0.09
10. (Lack) of Perseverance	21.17	4.89	23.23	4.24	2.13	.149	0.03
11. Difficulty Identifying Feelings	18.72	5.45	20.78	5.98	0.75	.388	0.10
12. Difficulty Describing Feelings	16.28	5.07	15.51	3.42	0.47	.494	0.06
13. Externally Oriented Thinking	22.10	4.45	22.10	3.66	0.40	.531	0.05

associated with alexithymia ($pr = .45$, $p < .001$) and self-defeating thinking ($pr = .26$, $p = .027$). No significant differences were observed on the other three dimensions.

Conclusions

The present study aimed to examine some deficits in cognitive and emotional functioning documented in adolescents with CD using a more stringent design, which controlled for problematic substance use, and used a high-risk comparison group with similar rates of mental disorders, migrant background, disrupted families and unemployed parents, therefore avoiding many of the potential confounding factors in previous studies.

We believe our more controlled design is responsible for our finding of similarly high alexithymia levels in both groups, suggesting alexithymia is not specific to CD, in line with high levels also documented in adults with depression⁵² or borderline personality disorder⁵³. Our adolescents with CD also didn't differ from their non-CD counterparts on nonverbal intellectual efficiency, both groups scoring in the normal to superior range, although the CD group had higher rates of school dropout. This confirms the results of the few studies that examined performance IQ separately from verbal one⁶, or focused on the performance versus verbal IQ discrepancy^{54,55}, suggesting that CD is not primarily related to non verbal intellectual deficits.

As to cognitive flexibility, we did not replicate results from studies comparing more contrasted groups of adolescent offenders and community youths^{5,12}, in that we observed no significant differences on the WCST. Remarkably, both of our groups scored in the normality range, consistent with

another null result obtained between community and CD youths after adjusting for verbal IQ¹³. However, we cannot rule out the possibility that both of these null results are due to the studies not taking into account callous-unemotional traits, which are known to be associated with impairments in the formation of stimulus-reinforcement associations^{56,57}. On the other hand, our CD youths self-reported a significantly reduced cognitive flexibility in stressful situations, compared to high-risk youths without CD, replicating differences found between community girls and their counterparts with CD³². This tendency for black-and-white thinking when under stress seems to capture a specific coping style, which appears to be associated with reduced emotional information processing and cognitive flexibility, and might constitute an interesting specific target for a coping skills intervention.

Impulsive behavioural responses were higher than normative values in both of our groups; however no significant differences were found between them, even if adolescents with CD reported a significantly stronger tendency to act-out when experiencing negative emotions than those without CD. Positive relationships between trait impulsivity and deviant behavior are well documented in community samples (e.g.^{24,58-60}). Still it had only been demonstrated in a limited number of small samples of clinical adolescents with disruptive behaviours²¹, or CD associated with substance abuse⁶¹. This study is thus, to our knowledge, the first demonstration of higher acting-out in CD adolescents compared with youths presenting similar rates of SUD, depression, self-harm, and suicide attempts, after controlling for the severity of problematic substance use and depression. Unfortunately, ADHD and borderline personality traits were not assessed in this sample. Given that impulsivity is as well a predominant fea-

ture in these disorders⁶², further studies taking them into account are needed. So far, our findings suggest that acting-out is frequent in CD adolescents and is related to alexithymia and self-defeating thinking. This constellation of quick and disproportionate reactions, in the context of difficulties in identifying and expressing feelings and lack of confidence in oneself, may constitute a second promising target for a coping skills intervention specific to CD. The heightened self-defeating thinking found in our CD male adolescents had previously been documented in small groups of girls with CD, but also with SUD, compared to community girls³². Further systematic comparisons of clinical groups are needed to confirm our results as to deficits characterizing adolescents with CD, and to refine them by taking into account CD subgroups such as with early onset and with callous-unemotional traits.

All significant differences between the CD and non-CD groups were observed on self-report measures, while none were found for performance tasks, which might be in part due to shared method variance, since CD was self-reported. However, both performance tasks investigated “cold executive functions”, i.e. performances obtained outside emotional activation, while the significant self-report measures concentrated on situations of negative affect or stress, which is in line with a recent finding that decision-making (measured through performance tasks) is impaired in CD adolescents under conditions of emotional arousal, but not outside of it¹³.

Other limitations of the present study are its sample composed exclusively of boys, restricting the generalization of its findings to girls with CD, its cross-sectional design, which precludes ascertaining whether the observed deficits are antecedent of CD or mere concomitants, and its limited sample size, which did not allow us to assess the indepen-

dent impact of school dropout, on which the two groups differed. Another point is that CD was assessed by self-report questionnaire, which can be sensitive to social desirability bias and lead to restricted reliability, compared with multiple informants' reports. Nevertheless, a systematic comparison of youth and parent reports has shown the former to be more appropriate⁶³, and police reports are known to overlook a number of offences⁶⁴.

In conclusion, using a control group with a comparably high prevalence of most mental disorders and controlling for substance problematic use and depression, the present findings suggests CD to be associated with stronger tendencies to act-out under negative affect, and to think in a self-defeating and rigid way when under stress, indicative of a dysfunction in specific emotional regulation and cognitive coping competencies. Consequently, skills training in these domains^{65,66} could constitute additional useful interventions in juvenile offenders with CD, for example by teaching them tools to identify their negative emotional states before they reach high intensity levels, to reduce negative affect without acting-out, to maintain a positive self-image when under stress, and to “step back” and analyze the situation, before acting, when stressed.

Acknowledgements

The present study was funded by a grant from the Swiss National Science Foundation (no. 3200B0-109827, 2005-2007). The authors would like to thank the adolescents and the staff of the participating institutions for their kind cooperation, as well as Alexandra Jubin, Mathias Romailier, Pascal Weinguni, and Laura Udry-Jørgensen for their help in data collection, and Christina Moses Passini for carefully proofreading the manuscript.

References

1. Fazel S, Doll H, Langstrom N. Mental disorders among adolescents in juvenile detention and correctional facilities: a systematic review and metaregression analysis of 25 surveys. *J Am Acad Child Adolesc Psychiatry* 2008; 47(9): 1010-1019.
2. Cunliffe T. Arresting Youth Crime - A Review of Social Skills Training with Young Offenders. *Adolescence* 1992; 27(108): 891-900.
3. Leiber MJ, Mawhorrt TL. Evaluating the Use of Social Skills Training and Employment with Delinquent Youth. *J Crim Justice* 1995; 23(2): 127-141.
4. Beauchaine TP, Gatzke-Kopp L, Mead HK. Polyvagal Theory and developmental psychopathology: Emotion dysregulation and conduct problems from preschool to adolescence. *Biol Psychol* 2007; 74(2): 174-184.
5. Lueger RJ, Gill KJ. Frontal-Lobe Cognitive Dysfunction in Conduct Disorder Adolescents. *J Clin Psychol* 1990; 46(6): 696-706.
6. Lynam D, Moffitt T, Stouthamer-Loeber M. Explaining the relation between IQ and delinquency - class, race, test motivation, school failure, or self-control. *J Abnorm Psychol* 1993; 102(2): 187-196.
7. Clarizio HF. Conduct disorder: Developmental considerations. *Psychol Sch* 1997;34(3):253-265.
8. Messier LP, Ward TJ. The coincidence of depression and high ability in delinquent youth. *J Child Fam Stud* 1998; 7(1): 97-105.
9. Tranah T, Harnett P, Yule W. Conduct disorder and personality. *Pers Individ Dif* 1998; 24(6): 741-745.
10. Teichner G, Golden CJ. The relationship of neuropsychological impairment to conduct disorder in adolescence: A conceptual review. *AggressViolent Behav* 2000; 5(6): 509-528.
11. Heaton RK. Wisconsin Card Sorting Test Manual. Odessa: Psychological Assessment Ressources; 1981.
12. Kim M, Kim J, Kwon J. Frontal P300 decrement and executive dysfunction in adolescents with conduct problems. *Child Psychiatry Hum Dev* 2001; 32(93): 106.
13. Fairchild G, van Goozen SHM, Stollery SJ, Aitken MRF, Savage J, Moore SC, *et al.* Decision making and executive function in male adolescents with early-onset or adolescence-onset conduct disorder and control subjects. *Biol Psychiatry* 2009; 66(2): 162-168.
14. Blair RJR. A cognitive developmental-approach to morality - Investigating the psychopath. *Cognition* 1995; 57(1): 1-29.
15. Dodge KA. The structure and function of reactive and proactive aggression. In: Pepler DJ, Rubin KH, editors. *The development and treatment of childhood aggression*. Hillsdale, NJ: Lawrence Erlbaum Associates; 1991. p. 201-218.
16. Mitchell D, Blair RJR. State of the art: Psychopathy. *Psychologist* 2000; 13: 356-360.
17. Dougherty DM. IMT/DMT Immediate Memory Task & Delayed Memory Task: A research tool for studying attention and memory processes (Version 1.2), Computer Software Manual. Houston, Texas: Neurobehavioral Research Laboratory and Clinic, University of Texas Science Center; 1999.
18. Dougherty DM, Bjork JM, Harper RA, Marsh DM, Moeller FG, Mathias CW, *et al.* Behavioral impulsivity paradigms: a comparison in hospitalized adolescents with disruptive behavior disorders. *J Child Psychol Psychiatry* 2003; 44(8): 1145-1157.
19. Swann AC, Bjork JM, Moeller FG, Dougherty DM. Two models of impulsivity: Relationship to personality traits and psychopathology. *Biol Psychiatry* 2002; 51(12): 988-994.
20. Mathias CW, Marsh-Richard D, Dougherty DM. Behavioral measures of impulsivity and the Law. *Behav Sci Law* 2008; 26: 691-707.
21. Thompson LL, Whitmore EA, Raymond KM, Crowley TJ. Measuring impulsivity in adolescents with serious substance and conduct problems. *Assessment* 2006; 13(1): 3-15.
22. Dickman SJ. Functional and dysfunctional impulsivity - Personality and cognitive correlates. *J Pers Soc Psychol* 1990; 58(1): 95-102.
23. Moeller FG, Barratt ES, Dougherty DM, Schmitz JM, Swann AC. Psychiatric aspects of impulsivity. *Am J Psychiatry* 2001; 158(11): 1783-1793.
24. White JL, Moffitt TE, Caspi A, Bartusch DJ, Needles DJ, Stouthamer-Loeber M. Measuring Impulsivity and Examining Its Relationship to Delinquency. *J Abnorm Psychol* 1994; 103(2): 192-205.
25. Dougherty DM, Dew RE, Mathias CW, Marsh DM, Addicott MA, Barratt ES. Impulsive and premeditated subtypes of aggression in conduct disorder: Differences in time estimation. *Aggress Behav* 2007; 33(6): 574-582.
26. Whiteside SP, Lynam DR. The Five Factor Model and impulsivity: Using a structural model of personality to understand impulsivity. *Pers Individ Dif* 2001; 30(669): 689.
27. Miller J, Flory K, Lynam D, Leukefeld C. A test of the four-factor model of impulsivity-related traits. *Pers Individ Dif* 2003; 34(8): 1403-1418.

28. Nemiah JC, Freyberger H, Sifneos PE. Alexithymia: A view of psychosomatic process. In: Hill OW, editor. *Modern trends in psychosomatic medicine*. London: Butterworths; 1976. p. 430-439.
29. Langevin R, Hare R. Psychopathie et alexithymie chez un groupe de jeunes contrevenants. *Revue de Psychoéducation et d'Orientation* 2001; 30(2): 227-236.
30. Zimmermann G. Delinquency in male adolescents: The role of alexithymia and family structure. *J Adolesc* 2006; 29(3): 321-332.
31. Epstein S. CTI Constructive Thinking Inventory professional manual. Psychological Assessment Resources, Inc. ed. Lutz: 2001.
32. Mezzich AC, Tarter RE, Kirisci L, Hsieh YC, Grimm M. Coping Capacity in Female Adolescent Substance-Abusers. *Addict Behav* 1995; 20(2): 181-187.
33. Teplin LA, Abram KM, McClelland GM, Dulcan MK, Mericle AA. Psychiatric disorders in youth in juvenile detention. *Arch Gen Psychiatry* 2002; 59: 1133-1143.
34. Ochsner KN, Gross JJ. The cognitive control of emotion. *Trends Cogn Sci* 2005; 9(5): 242-249.
35. Pessoa L. Cognition and emotion. *Scholarpedia* 2009; 4(1): 45-67.
36. Pedersen W, Mastekaasa A, Wichstrom L. Conduct problems and early cannabis initiation: a longitudinal study of gender differences. *Addiction* 2001; 96(3): 415-431.
37. Wichstrom L, Skogen K, Oia T. Increased rate of conduct problems in urban areas: What is the mechanism? *J Am Acad Child Adolesc Psychiatry* 1996; 35(4): 471-479.
38. Germain M, Guyon L, Landry M. Grille de dépistage de consommation problématique d'alcool et de drogues chez les adolescentes et les adolescents (DEP-ADO). Montréal: RISQ; 2000.
39. Landry M, Guyon L, Bergeron J, Provost G. Évaluation de la toxicomanie chez les adolescents. Développement et validation d'un instrument. *Alcoologie et Addictologie* 2002; 24(1): 7-13.
40. Bernard M, Bolognini M, Plancherel B, Chinnet L, Laget J, Stephan P, et al. French validity of two substance-use screening tests among adolescents: A comparison of the CRAFFT and DEP-ADO. *J Subst Use* 2005; 10(6): 385-395.
41. Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiller E, et al. The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *J Clin Psychiatry* 1998; 59(Suppl 20): 22-57.
42. Raven J, Court J, Raven J. *Progressive Matrices Standard (PM38)*. Oxford: Oxford Psychologists Press; 1998.
43. Greve KW, Stickler TR, Love JA, Bianchini KJ, Stanford MS. Latent structure of the Wisconsin Card Sorting Test: a confirmatory factor analytic study. *Arch Clin Neuropsychol* 2005; 20(3): 355-364.
44. Dougherty DM, Marsh DM, Moeller FG, Chokshi RV, Rosen VC. Effects of moderate and high doses of alcohol on attention, impulsivity, discriminability, and response bias in immediate and delayed memory task performance. *Alcohol Clin Exp Res* 2000; 24(11): 1702-1711.
45. Van der Linden M, d'Acremont M, Zermatten AN, Jermann F, Lari F, Willems S, et al. A French adaptation of the UPPS Impulsive Behavior Scale - Confirmatory factor analysis in a sample of undergraduate students. *Eur J Psychol Assess* 2006; 22(1): 38-42.
46. Taylor GJ, Ryan D, Bagby RM. Toward the development of a new self-report alexithymia scale. *Psychother Psychosom* 1985; 44(4): 191-199.
47. Loas G, Otmani O, Fremaux D, Lecercle C, Duflot M, Delahousse J. Etude de la validité externe, de la fidélité et détermination des notes seuils des échelles d'alexithymie de Toronto (TAS et TAS-20) chez un groupe de malades alcooliques. *L'Encéphale* 1996; 22: 35-40.
48. Loas G, Corcos M, Stephan P, Pellet J, Bizouard P, Venisse JL, et al. Factorial structure of the 20-item Toronto Alexithymia Scale Confirmatory factorial analyses in nonclinical and clinical samples. *J Psychosom Res* 2001; 50(5): 255-261.
49. Pihet S, Suter M, Halfon O, Stephan P. Psychometric properties of the French translation of the Constructive Thinking Inventory. Submitted 2009.
50. American Psychiatric Association. *The diagnostic and statistical manual of mental disorders*. 4 ed. Washington, DC: American Psychiatric Association; 1994.
51. Lecrubier Y, Weiller E, Hergueta T, Amorim P, Bonoira LI, Lépine JP, et al. M.I.N.I. Mini International Neuropsychiatric Interview. Version française 5.0.0 DSM-IV; 1998.
52. Conrad R, Wegener I, Imbierowicz K, Liedtke R, Geiser F. Alexithymia, temperament and character as predictors of psychopathology in patients with major depression. *Psychiatry Res* 2009; 165(1-2): 137-144.
53. Ebner-Priemer UW, Welch SS, Grossman P, Reisch T, Linehan MM, Bohus M. Psychophysiological ambulatory assessment of affective dysregulation in borderline personality disorder. *Psychiatry Res* 2007; 150(3): 265-275.

54. Cornell DG, Wilson LA. The Piq Greater-Than Viq Discrepancy in Violent and Nonviolent Delinquents. *J Clin Psychol* 1992; 48(2): 256-261.
55. Walsh A, Petee TA, Beyer JA. Intellectual Imbalance and Delinquency - Comparing High Verbal and High-Performance Iq Delinquents. *Crim Justice Behav* 1987; 14(3): 370-379.
56. Blair RJR. Applying a cognitive neuroscience perspective to the disorder of psychopathy. *Dev Psychopathol* 2005; 17(3): 865-891.
57. Frick PJ, White SF. Research Review: The importance of callous-unemotional traits for developmental models of aggressive and antisocial behavior. *J Child Psychol Psychiatry* 2008; 49(4): 359-375.
58. Loeber R, Farrington DP, Stouthamer-Loeber M, Moffitt TE, Caspi A, Lynam D. Male mental health problems, psychopathy, and personality traits: key findings from the first 14 years of the Pittsburgh Youth Study. *Clin Child Fam Psychol Rev* 2001; 4(4): 273-297.
59. Luengo MA, Carrillodelapena MT, Otero JM, Romero E. A Short-Term Longitudinal-Study of Impulsivity and Antisocial-Behavior. *J Pers Soc Psychol* 1994; 66(3): 542-548.
60. Tittle CR, Ward DA, Grasmick HG. Self-control and crime/deviance: Cognitive vs. behavioral measures. *J Quant Criminol* 2003; 19(4): 333-365.
61. Soloff PH, Lynch KG, Moss HB. Serotonin, impulsivity, and alcohol use disorders in the older adolescent: A psychobiological study. *Alcohol Clin Exp Res* 2000; 24(11): 1609-1619.
62. Hochhausen NM, Lorenz AR, Newman JP. Specifying the impulsivity of female inmates with borderline personality disorder. *J Abnorm Psychol* 2002; 111(3): 495-501.
63. Colins O, Vermeiren R, Schuyten G, Broekaert E, Soye V. Informant agreement in the assessment of disruptive behavior disorders in detained minors in Belgium: A diagnosis-level and symptom-level examination. *J Clin Psychiatry* 2008; 69(1): 141-148.
64. Moffitt TE, Caspi A. Childhood predictors differentiate life-course persistent and adolescence-limited antisocial pathways among males and females. *Dev Psychopathol* 2001; 13(2): 355-375.
65. Fraser MW, Galinsky MJ, Smokowski PR, Day SH, Terzian MA, Rose RA, *et al.* Social information-processing skills training to promote social competence and prevent aggressive behavior in the third grade. *J Consult Clin Psychol* 2005; 73(6): 1045-1055.
66. Lochman JE, Wells KC. The coping power program for preadolescent aggressive boys and their parents: Outcome effects at the 1-year follow-up. *J Consult Clin Psychol* 2004; 72(4): 571-578.

Author for correspondence:

Sandrine Pihet

Service Universitaire de Psychiatrie de l'Enfant

et de l'Adolescence

Unité de Recherche

Rue du Bugnon 25A

CH-1011 Lausanne

Switzerland

Phone: +41 (0) 21 314 74 92

Fax: +41 (0) 21 314 74 81

E-mail: Sandrine.Pihet@chuv.ch