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## **THE CRACOW INSTRUMENT**

A NEW FRAMEWORK FOR THE ASSESSMENT  
OF MULTI-PROBLEM VIOLENT YOUTH

RESEARCH REPORT 2011-01

**NATIONAL CRIME PREVENTION CENTRE / CENTRE NATIONAL DE PRÉVENTION DU CRIME**

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Canada 



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**Published by:**

National Crime Prevention Centre (NCPC)  
Public Safety Canada  
Ottawa, Ontario Canada  
K1A 0P8

**Visit the Public Safety website and add your name to the NCPC Mailing List:  
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**Catalogue number:** PS4-116/2011E-PDF  
**ISBN:** 978-1-100-17841-7

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*La présente publication est aussi disponible en français. Elle s'intitule : Le Test de CRACOVIE : un nouveau cadre d'évaluation des jeunes violents présentant de multiples problèmes.*

## THE CRACOW INSTRUMENT

### A NEW FRAMEWORK FOR THE ASSESSMENT OF MULTI-PROBLEM VIOLENT YOUTH

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## Executive Summary

Currently, there is a limited number of reliable and valid assessment tools for multi-problem youth which can be used at the earliest developmental stages (e.g., conception to birth and early childhood — birth through age 5). The current study examined a revised version of the CRACOW, a risk/needs instrument for multi-problem violent youth in early childhood which was first proposed by Corrado (2002). The CRACOW was designed to be a multi-stage instrument representing the risk/needs factors in youth at various developmental stages, starting at the pre/perinatal period and extending to adolescence to account for exposure and accumulation of a number of dynamic risk factors that may influence the risk of youth violence. The instrument was designed to be comprehensive, parsimonious, while being theoretically and empirically guided to assist government and community agencies in developing individual, familial, and community interventions intended to reduce the risk of youth violence.

The CRACOW is an assessment tool that includes three interrelated sections. The first section refers to the risk/needs factors associated with multi-problem youth. The CRACOW takes into consideration that some of these factors operate earlier than others in the child's development, whether it is at birth, early childhood, middle/late childhood, or adolescence. The second section refers to treatment interventions, more specifically the parents and the child responses to all interventions aimed at the risk/needs factors. Finally, the third section allows for the assessment of externalizing behaviours, including aggression and violence.

The current study examines the validity of the first section of the CRACOW instrument. More specifically, the study tests whether the risk/needs factors in early childhood included in the CRACOW help to identify the most physically aggressive preschoolers. The study is based on the first 100 children (boys,  $n=58$ ; girls,  $n=42$ ) recruited as part of the Vancouver Longitudinal Study on the Psychosocial Development of Children (KD-BEAR Project; Kids' Development of Behavioural, Emotional and Aggression Regulation) conducted in Vancouver, British Columbia, Canada. The KD-BEAR Project is an on-going longitudinal project, which aims to inform policymakers about the key early risk and protective factors of aggression and violence in at-risk children from the earliest developmental periods.

All children included in the study were recruited between February 2008 and April 2009. Two samples were recruited for this study. First, a clinical sample ( $n=14$ ) was recruited from the Infant Psychiatric Clinic at the BC Children's Hospital. Second, the research program also included a community sample ( $n=86$ ) for comparative purposes. The community sample was recruited in vulnerable neighbourhoods in the city of Vancouver and the Greater Vancouver Regional District.

A series of latent-class analyses (LCA) were used to identify the presence of latent profiles of physically aggressive children. The frequency of physical aggression in the past year was measured using four items (i.e., kicking, shoving, fighting, and throwing objects at others). LCA analyses of these four indicators of physical aggression suggested the presence of three groups of physically aggressive children: (a) low-level group (36% of the sample); (b) a medium-level group (34% of the sample); and (c) a high-level group (30% of the sample). These three groups of children showed few significant differences on sociodemographic characteristics. The high-level group, however, was more likely to include Caucasians and clinically-referred children.

A series of analysis of variance were then conducted to determine whether the CRACOW instrument could help in identifying the three groups of physically aggressive children on all the risk/needs items of the CRACOW for the period of early childhood. The partial effect sizes varied between .00- .15, with an average of .05 thus suggesting that single risk/needs factors have a small effect on high levels of physical aggression. The high-level group of physically aggressive children were more likely to have been exposed to maternal substance use during pregnancy, and to have had birth related complications. The parents



of the highly aggressive children were also more likely to show low educational achievements, economic dependency, antisocial attitudes, antisocial behaviours as well as a hostile parenting style. Furthermore, the findings of the analyses of variance indicated that highly aggressive children were more likely to show evidence of an attention deficit disorder, callousness, negative emotionality, as well as daring and risk taking attitudes.

When exploring domains of risk/needs factors of the CRACOW, several important differences also emerged. The partial effect sizes of risk domains varied between .08-21, thus being higher than single risk/needs items. Findings showed that the highly aggressive children were more likely to have risk/needs factors in the following five domains: (a) pre/perinatal; (b) socioeconomic; (c) family environment; (d) child psychological functioning; and (e) parenting. These children were more likely to show evidence of psychological deficits, to have been exposed to pre/perinatal risk factors, and to come from low socioeconomic situations with criminogenic family environment characterized by poor parenting skills. When the scores on each of those scales were summed to create the CRACOW score, not surprisingly, significant statistical differences emerged. The highly aggressive group showed higher scores on the CRACOW scale than the two other groups. In other words, highly aggressive children had been exposed to a higher number of different domains of risk factors. The CRACOW total score significantly helped to identify highly aggressive children (area under the curve, AUC=.77), without being confounded by other factors such as gender, ethnicity, and being clinically-referred for an externalized disorder.

The CRACOW instrument is showing promising results for the assessment of multi-problem violent youth. The findings suggest that the instrument is capturing significant environmental and individual risk factors of aggression in preschoolers. The findings also suggest that the instrument has significant postdictive accuracy in identifying highly aggressive children. Of importance, 70% of the highly aggressive children were recruited from vulnerable neighbourhoods. These children were showing a level of physical aggression comparable to most of the clinically-referred children included in the study. This is of concern as these children are at risk of escalating to more serious forms of antisocial and aggressive behaviours. In fact, the CRACOW identified both early developmental and empirically supported risk/needs factors that have been shown to be related to serious and violent delinquency during adolescence. It seems, therefore, that the risk/needs factors are operating earlier than criminologists and other social scientists might have believed until recently, as the focus for the understanding and the prevention of youth violence has often been put on the period of adolescence. These findings further reinforce the need for a multi-gate preventive strategy starting at the earliest developmental stages and continuing throughout childhood and adolescence. First, it highlighted that several risk domains (e.g., pre/perinatal, socioeconomic, parenting) could be targeted for such developmental prevention efforts. Second, the current study showed that the targets of these prevention programs need to be developmentally-informed considering that, as the child ages, he/she is exposed to new risk factors. Finally, the findings demonstrated that highly aggressive children are those exposed to multi-risk factors often acting in combination, thus suggesting the need of multi-services to address and intervene on these risk factors.





# Introduction

## The CRACOW Instrument

### Origins and Purpose

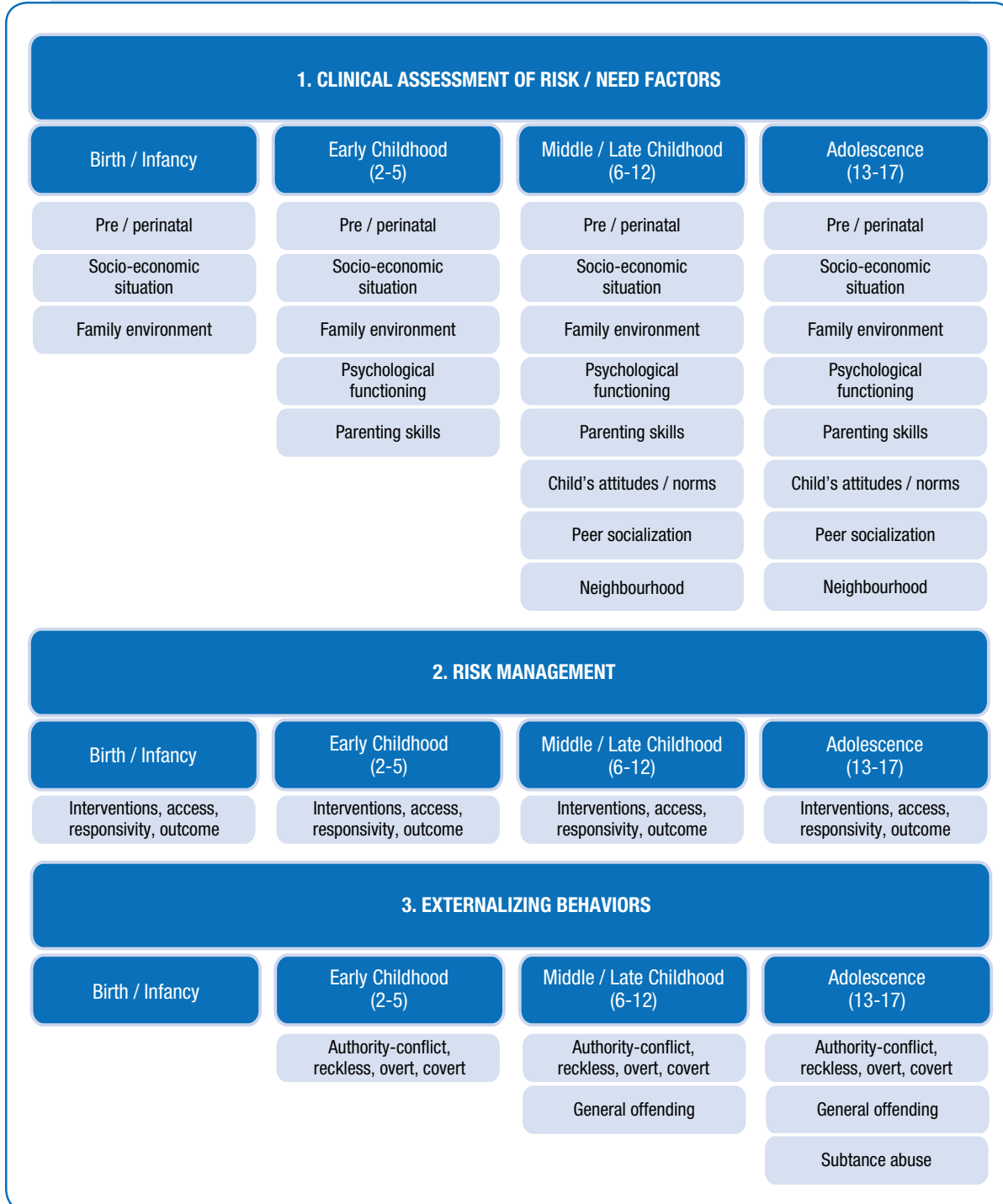
The CRACOW in its earlier form originated from an advanced research workshop funded by the Scientific Affairs Division of the North Atlantic Treaty Organization (NATO). This research workshop involved more than thirty scholars from sixteen different countries and was held in the summer of 2000 in CRACOW, Poland<sup>1</sup>. The purpose of the workshop was to create a procedure for assessing risks and needs factors of violent youth. Although specific risk instruments were available at the time, researchers felt that none of the instruments addressed multiple developmental periods and were comprehensive enough in either nature or scope<sup>2</sup>. Following the discussions and presentations held at the workshop, a comprehensive instrument, named the CRACOW, was proposed.

The instrument was designed to assist and guide government and community agencies in developing individual, familial, and community interventions intended to reduce the risk of youth violence. Youth violence was defined as the actual, attempted or threatened physical harm of another person perpetrated by a child or an adolescent<sup>3</sup>. While the instrument aimed at informing policymakers about the risk/needs factors of youth violence, it was recognized that the instrument would lack some degree of specificity considering that violent youth also tended to be involved in serious but nonviolent delinquency. Not surprisingly, there is some overlap between the risk factors of youth violence and those of chronic offending<sup>4</sup>, serious offending<sup>5</sup>, and sexual offending<sup>6</sup>. The instrument, however, was not designed and not intended for the assessment and management of youth involved in minor forms of antisocial, criminal behaviours (e.g., drug use, minor property crimes, truancy, etc.). The instrument was specifically designed for assessment (i.e., evaluation of the individual and his or her environment for the purpose of determining the risk of future violent behaviour) and management purposes (i.e., intervention to reduce the risk of violence).

### Developmental risk/needs assessment tool

The instrument aimed to be multi-stage by representing the risk/needs factors in youth at various developmental stages, starting at the pre/perinatal period. Most of the current instruments used for assessing youth, such as the Structured Assessment of Violence Risk in Youth (SAVRY)<sup>7</sup>, the Youth Level of Service/Case Management Inventory (YLS-CMI)<sup>8</sup>, and the Measure of Social and Personal Adaptation for Adolescents in Quebec (MASPAQ)<sup>9</sup> were developed for the 12 to 18 population. More recent studies have proposed instruments designed for the 6 to 12 population (EARL-20)<sup>10</sup>. These instruments are developmentally-informed in the sense that they incorporate developmental factors that are specific to the developmental stages they target. While these instruments are developmentally-informed, they are limited to one particular developmental period, that is, the current period of the youth (i.e., middle/late childhood; adolescence). As a result, some aspects of the dynamic development of aggression and violence are not incorporated in the instruments. Of importance, these instruments may be missing the risk/needs factors that are present in the earliest stages of the child's development which are associated with aggression and violence<sup>11</sup>. The CRACOW aims to address this limitation by incorporating the risk factors that are salient at various life stages during childhood and adolescence.

**FIGURE 1. CRACOW INSTRUMENT FOR MULTI-PROBLEM VIOLENT YOUTH, REVISED MODEL**



The CRACOW was designed to recognize the fact that the aging child is exposed to an increasing number of risk factors that may influence the risk of youth violence. The instrument recently changed from its original framework<sup>12</sup> to reflect current developments in the field of aggression and violence. More specifically, the latest version of the CRACOW is organized so it includes risk/needs factors that span from birth to the end of adolescence.

The CRACOW was also designed to characterize the dynamic development in youth, to incorporate a wide array of risk/needs factors of youth violence, and to be in line with a developmental perspective on youth violence. The instrument was thus designed to be comprehensive, parsimonious, while being theoretically and empirically guided. These are all important components of rigorous assessment tools for youth<sup>13</sup>.

## The Theoretical/Empirical Rationale of the CRACOW

In its current and revised version, the CRACOW (Figure 1) incorporates four developmental periods (i.e., birth/infancy, early childhood, middle/late childhood, and adolescence). This conceptual framework is built around five organizing and overarching principles about the risk/needs of violent youth that are embedded in the developmental-life-course perspective of offending. These principles suggest that the risk of aggression and violent behaviour entails a dynamic process, involving qualitative and quantitative behavioural changes over time that are multi-determined as a result of the accumulation of series of age-graded risk factors. We review these principles and how they relate to the assessment of risk/needs.

### Aggression/violence involves a dynamic process

The relation between childhood aggression and violence during adolescence and adulthood is well established but not completely understood<sup>14</sup>. Aggression and violence are dynamic phenomena and their occurrence is best described by a developmental process. Three key processes characterize their development: (a) activation phase (i.e., the level at which the behaviour is manifested from its onset); (b) persistence phase (i.e., continuity of the behaviour over time), and; (c) desistance phase (i.e., the slowing down and the termination of the behaviour over time). In other words, aggressive and violent behaviours can be plotted as a trajectory that can increase, reach a plateau and decrease over time. Longitudinal studies show that the general trend of physical aggression can be represented by an increase from 17 to 30 months, followed by a gradual decline up to the school entry<sup>15</sup>.

There are individual differences characterizing patterns of activation, persistence and desistance which can be represented by developmental trajectories. Different trajectories have been identified for the early to middle childhood period typically characterized by four to five groups: one or two groups of low-level; one group of moderate desisters; one group of high-level desisters; and one group of high-level persisters<sup>16</sup>. Similar patterns have been observed for the middle to late childhood period (i.e., 6 to 12 years old) where three to four trajectories are typically reported<sup>17</sup>. Using data from 6 different studies collected in three different countries, Broidy et al. (2003) found that the prevalence of a high-level or chronic group varied between 4 to 11% in samples of boys and 0 to 10% in samples of girls. During early childhood, the group of high-level physically aggressive children have been found to constitute 16.6% of a representative sample of Canadians aged 2 to 11<sup>18</sup> and 14% in a sample of boys and girls followed from 5 to 42 months<sup>19</sup>. All trajectories of aggression and violence can be characterized by an onset, a plateau and desistance, but at different levels. Risk assessment should account for the presence of different trajectories as well as the three main mechanisms characterizing its development — activation, persistence and termination.

## **Aggression/violence is relatively predictable from past behaviours**

While there are quantitative changes in aggression and violence characterized by different patterns of activation, persistence and termination, there are also important qualitative changes over time<sup>20</sup>. From a developmental perspective, manifestation of aggression and violence develops along a continuum with behaviours constantly evolving as the child ages and persists. Hence, there is a series of age-graded manifestations of aggressive and violent behaviours that follows a relatively predictable path. These manifestations change as the aging child is exposed to different social contexts, settings, and opportunities<sup>21</sup>. This process has been referred to as heterotypic continuity, or the persistence of conceptually similar but different behaviours over time. The qualitative changes in aggression and violence have been extensively described and documented by Loeber and colleagues<sup>22</sup>. These researchers found evidence of a three pathways model that can account for most delinquent patterns: (a) authority-conflict pathway; (b) covert pathway; and (c) overt pathway. Most children will not go through all stages as termination of the behaviour tends to occur at the earliest stages. Hence, as aggression and violence develops along a developmental pathway, past behaviours may inform risk assessors about the behaviour that may follow if the child persists in being aggressive and violent. We concur with LeBlanc (1999) in saying that the best predictors of future behaviour is past behaviour. Trajectories of physical aggression are linked to those of violent and nonviolent delinquency during adolescence<sup>23</sup>. In fact, physical aggression has been shown to be linked to violent and non-violent juvenile delinquency, even after controlling for potentially confounding factors such as nonaggressive conduct problems, and being oppositional and hyperactive<sup>24</sup>.

## **Aggression/violence is multidetermined**

The risk of aggressive and violent behaviours involves a combination of individual and environmental factors. This is often referred to as the principle of equifinality or the possibility of various causes leading to the same outcome. This idea is consistent with the observation that a single risk factor typically shows a small-to-modest effect size<sup>25</sup>. Generally speaking, criminologists have emphasized the role of six key developmental processes: (1) biological vulnerabilities (i.e., genetic and/or biological deficits that may affect the neuropsychological development of children)<sup>26</sup>; (2) economic deprivation (i.e., the low socioeconomic situation, such as the poor educational background, difficulties finding a job, and the low family income, may have several negative influences on the child development, such as causing stress on the family and disrupting the quality of parenting)<sup>27</sup>; (3) personality development (i.e., the movement away from a purely egotistic and self-centered perspective to one characterized by prosociality and empathy and concerns for others)<sup>28</sup>; (4) bonding — the psychological and social attachment between the child and parents, as well as the child and social institution<sup>29</sup>; (5) modeling (i.e., exposure to aggressive and violent models which may reinforce the use of such behaviours in the child, especially when these aggressive/violent manifestations lead to compliance of the person being coerced or victimized)<sup>30</sup>; and (6) constraining of the behaviours which involves the development of adequate cognitive and behavioural skills to self-control urges to act in an aggressive or violent way<sup>31</sup>. A comprehensive risk assessment tool should include items tapping these six key mechanisms.

## **Aggression/violence is the result of an accumulation of risk factors**

Aggression and violence are the results of an accumulation of risk factors starting at the earliest developmental stages<sup>32</sup>. Hence, the risk of elevated levels of activity, persistence or delayed termination of aggression/violence should be understood as the accumulation effect of multiple risk factors and not the result of one specific risk factor. Individuals vary in terms of the number of risk factors they are exposed to, the number of risk factors that accumulates from one developmental period to another, but also the strength of these risk factors<sup>33</sup>. In line with Caspi and Roberts (2001), we understand the accumulation of risk along three dimensions: the genetic makeup (i.e., biological vulnerabilities, personality development); the social environment (i.e., economic deprivation, modeling, bonding, constraining); and the person-environment transactions.

Person-environment transactions involve three facets of developments that may impact the likelihood of aggression and violent behaviours<sup>34</sup>. The first facet, reactive transactions, refers to how an individual's temper, in combination with life experiences, will favour the emergence of particular interpretations or scripts of social situations and interactions<sup>35</sup>. Evocative transactions refer to the process by which the child evokes certain reactions from the environment. As the child ages and behaviours and attitudes persist, these reactions may be experienced in different contexts and settings (e.g., daycare, home, school, workplace). Proactive transaction involves the process by which the aging child selectively chooses settings, contexts and social environment that may reinforce rather than change his/her current behaviours, such as delinquent peers, gangs, organized crime, etc. The aggressive child, therefore, might come to interpret social interactions as negative and hostile, evoke negative reactions from others that may confirm these scripts, and, as a result, select specific environment that may entrench his/her disposition towards aggression/violence. These processes influence how risk factors are maintained over time, but also how new risk factors may be added.

### **Risk should be developmentally-informed as age-graded risk factors are operating**

Developmentalists, such as Loeber et al. (2008), understand the development as a series of life transitions to which the aging child is gradually exposed. As such, developmentalists typically distinguish the following life transitions: (a) birth; (b) preschool; (c) elementary school; (d) middle/secondary school; and (e) early adulthood. Each of these periods has been associated with specific risk factors linked to aggression and violence<sup>36</sup>. The domains of risk may change from one developmental period to another<sup>37</sup>. Therefore, the aging child is exposed to an increasing number of risk factors over time<sup>38</sup>. Similarly, life-course theorists understand life transitions as opportunities for change that may be more powerful than the developmental history<sup>39</sup>. In that regard, Elder (1998) argued that individual differences are minimized in life transitions when the new circumstances resemble a total institution (i.e., reform school, military service, prison, etc.)<sup>40</sup>. Developmentalists, however, have challenged this view by stressing the importance and the role of cumulative deficits<sup>41</sup>. The child's difficulties and deficits are likely to spill over and influence his/her ability to confront new risk factors and adapt to the new transitions, a process often referred to as cumulative deficits. Hence, children exposed to a higher number of adversities from birth may have more difficulties in developing the set of skills necessary to prepare for school entry. While long-term prediction of violent behaviours is far from being perfect, as a result of the dynamic processes associated with the development, it still shows that early childhood risk factors are linked to violent behaviours forty years later<sup>42</sup>. The persistence and accumulation of new risk factors across developmental periods should be an integral part of an assessment tool. The opposite is also true as life circumstances might change from one period to another and certain risk factors might be removed or stopped.

### **Aim of the Study**

The aim of the study is to provide baseline information about the validity of the CRACOW instrument at the earliest developmental stages. More specifically, this study will be focused on the concurrent validity of the assessment tool in the identification of highly aggressive children. The study will examine the convergent and postdictive validity of five domains of risk/protective factors; (a) pre/perinatal; (b) social structure; (c) family environment; (d) child's psychological functioning; and (e) parenting skills. In doing so, the study will examine the validity of each of those domains but also the effect of accumulation of risk factors through the total score on the CRACOW instrument.





## Methodology

### Sample

The study is based on the first 100 children (boys, n=58; girls, n=42) recruited as part of the Vancouver Longitudinal Study on the Psychosocial Development of Children (KD-BEAR Project; Kids' Development of Behavioural, Emotional and Aggression Regulation) conducted in Vancouver, British Columbia (BC), Canada. The KD-BEAR Project is an on-going longitudinal project which aims to inform policymakers about the key early risk and protective factors of aggression and violence in at-risk children from the earliest developmental periods. This project was initiated by the BC Ministry of Children and Family Development and the BC Ministry of Health, in collaboration with researchers affiliated with the BC Children's Hospital and the School of Criminology at Simon Fraser University.

All children included in the study were recruited between February 2008 and April 2009. Two samples were recruited for this study. First, a clinical sample (n=14) was recruited from the Infant Psychiatric Clinic at the BC Children's Hospital. Clinical practitioners informed the primary caregiver about the KD-BEAR project. The inclusion criteria were as follow: (1) the child is currently being assessed and/or treated for any externalization spectrum disorder; (2) the child is between three and five years old; (3) both the child and the primary caregiver have a reasonable understanding of English; and (4) the child and the primary caregiver reside in and around the city of Vancouver and the Greater Vancouver Regional District (GVRD). For the majority of this sample (58.3%), concern over the child's aggressive behaviour was one of the main reasons cited for referral to the clinic for assessment/treatment. Based on the clinical assessment conducted at the clinic, this sample of children was mainly characterized by Attention-Deficit-Hyperactivity Disorder (ADHD; 63.6%) and Oppositional Defiant Disorder (ODD; 18.2%).

Second, the research program also included a community sample (n=86) for comparative purposes. The community sample was recruited in vulnerable neighbourhoods in the city of Vancouver and the GVRD. More specifically, the recruitment took place in seven cities: Burnaby, Coquitlam, New Westminister, Port Coquitlam, Port Moody, Vancouver, and Surrey. In each of these cities, the neighbourhoods having been ranked in the lowest 25% percentile by two provincial surveys were selected for those studies<sup>43</sup>. This survey ranks the neighbourhoods according to various indicators related to the socio-economic status of the family and the psychosocial development of preschoolers. Based on the result of this survey, we established a catchment area of daycares in vulnerable neighbourhoods. Local managers of community daycares were contacted to participate in the study. In each of the participating daycares the research team put posters informing parents about the study. The inclusion criteria were similar for the community and the clinical samples with the exception that having been referred for an externalizing spectrum disorder was not a requirement for the community sample. It is important to stress the fact that the neighbourhoods, not the families or the children, were sampled for the study. It was therefore expected that, in spite of targeting vulnerable neighbourhoods, the community sample would still get a reasonable range of families in terms of risk factors (i.e., low-risk, medium-risk, high-risk).

### Procedures

The present study focused on the first wave of data. One in-person interview was conducted with each research participant. Simultaneous interviews with the primary caregiver and the child were conducted as part of the wave 1 data collection. The vast majority of primary caregivers interviewed were the biological mother of the child (88.1%). In rare instances, the biological father (7.0%) or an adoptive parent (5.0%) was interviewed. On average, the primary caregiver interview lasted about two and a half hours. The interview protocol was standardized across research participants and the data were collected using a computerized questionnaire. The child interview protocol was also standardized and lasted between



forty-five minutes and one and a half hours. The interview protocol included a series of tasks and tests which informed about the child's cognitive and self-regulation abilities. Both the primary-caregiver and the child-interviews were conducted by trained research assistants. The study was conducted according to the ethical guidelines set by Simon Fraser University, the University of British Columbia, and the BC Children's Hospital. Participants were either referred from The Child Infant Psychiatry Clinic at BC Children's Hospital or they responded to posters describing the project distributed in the community. Because of the unsolicited nature of the sampling procedure refusal rates are unknown. Participation in the study was voluntary and the participants were informed that they could withdraw from the study at any time. The primary caregivers were paid forty dollars for their participation in the study. They all signed a consent form indicating that the information was confidential and collected for research purposes only.

## Measures

### Covariates

Several covariates were included in the study to explore possible individual differences in the level of aggression. Two sets of characteristics were examined. First, child characteristics included four general individual characteristics; (a) gender (0=male; 1=female); (b) age (i.e., coded as the child's age at the time of the interview); (c) ethnic origin (0=Caucasian; 1=non-Caucasian); and (d) sample (i.e., whether the child was a clinical referral or recruited from the community) (0=clinical; 1=community). Second, we also included socio-demographic characteristics of the family environment: (1) a variable controlled whether the biological mother was interviewed (0=no; 1=yes); (2) the annual familial income was examined; (3) the covariates also included a variable measuring whether or not single parenthood reflected the family structure of the child (0=no; 1=yes); and (4) the study controlled for the presence of one or more siblings (0=no; 1=yes).

### CRACOW

The CRACOW<sup>44</sup> was coded based on an interview with the primary caregiver. The section referring to the risk management of aggression/violence was not included for the current study. The risk/needs section of the CRACOW was completed by the interviewers. For preschoolers, the section includes five domains or risk/needs factors: (a) pre/perinatal (Mean=2.10; SD=1.57; Range=0-8); (b) socioeconomic situation (Mean=2.06; SD=2.73; Range=0-9); (c) family environment (Mean=2.84; SD=2.18; Range=0-9); (d) child psychological functioning (Mean=3.90; SD=.230; Range=0-10); and (e) parenting (Mean=1.21; SD=1.24; Range=0-5).

The pre/perinatal domain (5 items) includes factors that may lead to or are associated with neuro-psychological deficits of the child (i.e., maternal substance use during pregnancy, pregnancy related complications, birth related complications, low birth weight, and premature birth). The socioeconomic situation (5 items) measures the presence of socioeconomic deprivation in the family (i.e., low occupational status, low family income, poor parental education, familial adversities [e.g., large family size, high residential mobility] and economic dependency). The family environment (6 items) taps the criminogenic aspect of the family of origin (i.e., mental health problems of parent(s); antisocial behaviours of parent(s); criminal history of parent(s); presence of intimate partner violence; poor familial support; and antisocial parental attitudes). The child psychological functioning (6 items) refers to the following: low verbal intelligence, callousness, negative emotionality, daring and risk taking, attention deficits, and hyperactivity. The parenting domain (4 items) includes risk/needs factors that measure the presence of a hostile parenting style; the lack of consistent discipline; lack of positive involvement with the child, and the presence of inadequate norms/rules.

Each of the items for the five domains of risk/needs factors were scored using a three-point scale: (0) absence of the risk factor; (1) risk factor is somewhat present; and (2) the risk factor is definitely present. Each domain was completed and scored by a research assistant using the information collected during the interview and following the scoring procedure of the instrument<sup>45</sup>. The score of the risk/needs factors were summed to create the total score of the CRACOW scale (26 items; Alpha=.77) for the preschool period (Mean=12.11; SD=6.19; Range=3-29).

## Physical aggression

In line with earlier studies on physical aggression in childhood<sup>46</sup>, four indicators were used to measure the level of physical aggression: (a) kicked, bitten, or hit anyone; (b) shoved, pushed; (c) fought (physical); and (d) thrown things at other people. The primary caregiver was asked to determine the frequency of each of those four manifestations using a four-point scale: (0) never; (1) a few times; (2) several times; and (3) very often. The majority of the children sampled for this study had kicked (64%), shoved (68%), fought (22%) or thrown things at someone (51%) at least once in the past year. As a group, this sample of children had been physically aggressive only a few times in the past year: kicked (Mean=1.13, Standard deviation=1.03, Range=0-3), shoved (Mean=1.22, SD=1.03, Range=0-3), fought (Mean=.42, SD=.85, Range=0-3), and thrown things (Mean=.83, SD=.93, Range=0-3). These averages, however, masked the fact that about one-third of our sample had, at least on several occasions, kicked (38%), shoved (32%), fought (16%) or thrown things at someone (28%) in the past year. Preschoolers were more likely to kick/shove than to fight ( $p<.001$ ) or to throw things at someone ( $p<.001$ ). They were also more likely to throw something at someone than to fight ( $p<.001$ ).

## Analytical Strategy

### Latent-class analysis

A series of latent-class analyses (LCA) were used to identify the presence of latent profiles of physically aggressive children. LCA is a statistical technique used to identify a set of mutually exclusive classes of individuals based on their responses to a series of categorical observations<sup>47</sup>. LCA analyses allowed the computation and estimation of two sets of parameters: (a)  $\Gamma$  (gamma) parameters representing class membership probabilities, and (b) P (rho) which refers to item-response probabilities conditional on group membership. More specifically, LCA predicts subjects' subgroup membership based on their responses to a set of observed categorical variables and produces mutually exclusive and exhaustive (non-overlapping) latent classes of individuals<sup>48</sup>.

The aim of this study was to examine the presence of mutually exclusive classes of preschool children based on their level of physical aggression in the past year. Four-items were used to examine the presence of profiles of physically aggressive children, that is, the frequency of kicking, shoving, fighting, and throwing objects. Those items are in-line with previous empirical studies on the trajectories of physically aggressive children<sup>49</sup>. The correlation between those four indicators of physical aggression was first screened and did not reveal the presence of redundant information (i.e., range  $r=.26-66$ ) for LCA. Considering the small sample size for this study, only a baseline model was created with no covariates included. Based on previous empirical studies on the presence of trajectories of physical aggressive children<sup>50</sup>, a two-to-six group solution was examined. In other words, a model with two groups was first examined, followed by a model with three groups, then a model with four groups and so on. The optimal solution was then determined using the likelihood-ratio  $G^2$  statistics, Akaike's Information criterion (AIC)<sup>51</sup>, and the Bayesian Information Criterion (BIC)<sup>52</sup>, along with class size probability and interpretability of each class identified. The analyses were conducted using PROC LCA, a procedure developed for SAS 9.2 by Lanza, Collins, Lemmon and Shaffer (2007).

# Results

## Profiles of Physically Aggressive Preschool Children

Table 1 presents the results of a series of latent class analyses. The goodness-of-fit information was examined for models with a two-to-six solution. For each solution, the likelihood  $G^2$ , the degrees of freedom, the AIC and the BIC are presented. The likelihood ratio  $G^2$  statistic dropped substantially from a two-group solution to a three-group solution then declined more gradually relative to the degree of freedom. Furthermore, the AIC was the lowest for the three-group solution. The BIC, however, suggested a two- or a three-group solution. Following recommendations by Lanza et al. (2007), the estimation was then repeated using different seeds ( $n=4$ ) to try different sets of starting values. The three-group model was identified as the dominant solution that was arrived at most frequently among the various sets of starting values.

**TABLE 1. LATENT CLASS ANALYSIS OF PHYSICAL AGGRESSION IN EARLY CHILDHOOD**

No. of Latent Classes	Likelihood Ratio $G^2$	Degrees of Freedom	AIC	BIC
2	129.94	230	179.94	245.56
3	98.56	217	174.56	274.31
4	80.01	204	182.01	315.88
5	68.79	191	196.79	364.79
6	63.01	178	217.01	419.14

Note. AIC refers to the Akaike Information Criterion. BIC refers to the Bayesian Information Criterion.

Taken together, these findings suggested that a solution consisting of three groups of physically aggressive children was the optimal solution for this dataset. An inspection of the parameters estimates from the three-group model suggested that the classes are distinguishable and non-trivial (i.e., no class with a near-zero probability of membership), and that meaningful labels can be assigned to each class found. The final three-group model selected presented high classification accuracy (entropy) based on posterior probabilities (see Table 2), confirming its stability and relevance.

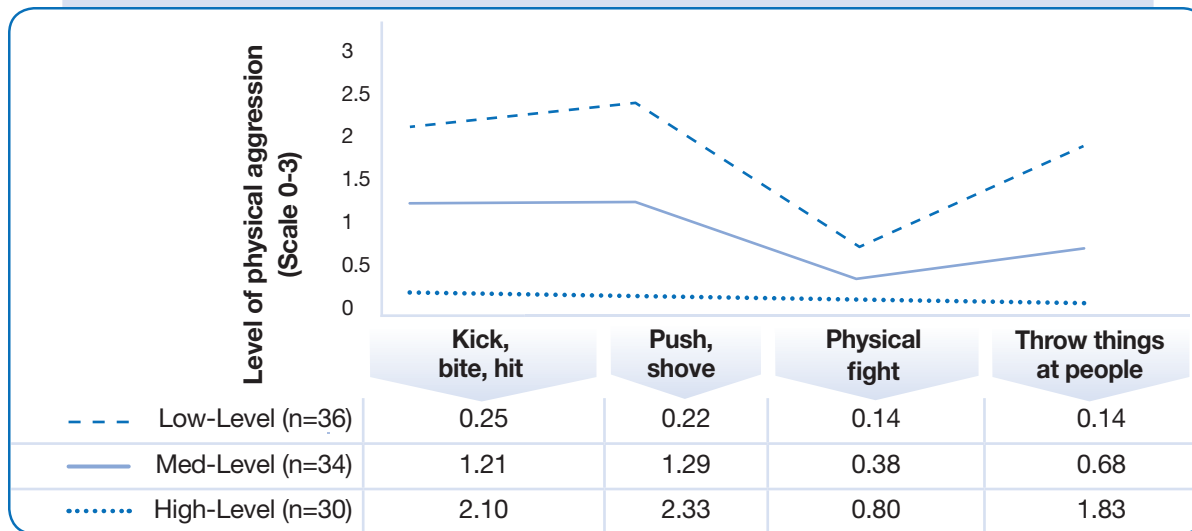
**TABLE 2. AVERAGE ASSIGNMENT PROBABILITIES BASED ON THE POSTERIOR PROBABILITY**

Latent Classes	Groups				Range
	Number Assigned % (n)	Low-Level	Medium-Level	High-Level	
Low-level group	36% (36)	<b>.96 (.11)</b>	.02 (.09)	.01 (.07)	.57-1.00
Medium-level group	34% (34)	.04 (.06)	<b>.94 (.10)</b>	.02 (.07)	.67-1.00
High-level group	30% (30)	.01 (.04)	.13 (.18)	<b>.86 (.18)</b>	.51-1.00

Note. Boldfaced type indicates the entropy, referring to the average classification accuracy when assigning participants to classes. Values closer to 1.00 indicate greater precision.

The differences between the three groups of preschoolers were significant and easily interpretable (Figure 2). The first group, the low-level, consisted of 36% of the sample and showed a low frequency of kicking, pushing, fighting and throwing objects at people, with all scores on these four items being close to 0 (i.e., never). The second group, the medium-level, represented 34% of the sample. This group included preschoolers who were occasionally physically aggressive in the past year, especially in terms of kicking and pushing others. Their average score for these two behaviours were higher than 1.00. Finally, the third group, the high-level, represented 30% of the sample. The preschoolers included in this group were regularly physically aggressive in the past year, with average scores close to or higher than 2.0 for three of the four items of physical aggression (i.e., kicking, pushing and throwing objects at people).

**FIGURE 2. AVERAGE LEVEL OF PHYSICAL AGGRESSION IN EARLY CHILDHOOD**



The three groups of preschoolers were then compared on a series of sociodemographic and descriptive factors relating to the child and his/her family (Table 3). The low-, medium- and high-level groups were compared as to the child's gender, ethnic group, the composition of the family and the presence of siblings, whether the biological mother was interviewed, the family annual income, and most importantly, whether the child was a clinical referral or not. The group comparison analyses revealed few significant differences across the three groups of children. In fact, the three groups differed only on two of these characteristics.

**TABLE 3. DESCRIPTIVE STATISTICS OF THE THREE GROUPS OF CHILDREN**

	Groups			Group Comparison
	Low-Level	Medium-Level	High-Level	
1. Gender (male)	50.0%	61.8%	63.3%	$X^2(2)= 1.49$ , ns
2. Ethnicity (Caucasian)	33.3%	54.5%	63.3%	$X^2(2)= 6.40$ , $p<.05$
3. Biological mother interviewed	91.7%	91.2%	93.3%	$X^2(2)= .11$ , ns
4. One of more siblings (yes)	66.7%	67.6%	70.0%	$X^2(2)= .87$ , ns
5. Single-parent family (yes)	13.9%	23.5%	23.3%	$X^2(2)=1.31$ , ns
6. Source (clinical referral)	8.3%	5.9%	30.0%	$X^2(2)=9.20$ , $p<.05$
7. Annual family income	\$90,142.86	\$68,951.52	\$62,666.67	$F(2,99)=2.08$ , ns

First, the low-level was the only group where children were not mainly Caucasians. Second, and not surprisingly, a significantly more important proportion of children recruited at the infant psychiatry clinic of BC Children's hospital were included in the highly aggressive children. Still, the clinical referrals represented only 30% of this group, meaning that children recruited from the community characterized the majority of those included in the high-level group. The high-level group was not more likely to include boys, children with siblings, children living in a single-parent family setting, or children living in families with a lower annual family income.

### **Items of the CRACOW Instrument and Physically Aggressive Children**

A series of analysis of variance were then conducted to determine whether the CRACOW instrument could help in identifying highly aggressive preschoolers. The three groups of preschoolers were compared on all the items of the five domains of risk/needs factors (i.e., pre/perinatal, socio-economic situation, family environment, child psychological functioning, and parental skills) included in the CRACOW. Under conditions of heterogeneity of variance across groups, the Welch statistic was analyzed followed by a non-parametric test (i.e., Kruskal-Wallis one-way analysis of variance) to confirm or not the presence of group differences. When significant differences were found, a stringent post-hoc test (Scheffe) was performed to determine which groups significantly differed from one another. The results are presented in Table 4.

**TABLE 4. LEVEL OF PHYSICAL AGGRESSION AND ITEMS OF THE CRACOW INSTRUMENT**

	Low-level (n=36)	Medlevel (n=34)	High-level (n=30)	F-Test (2, 99)	Post-hoc test	Partial Eta squared
<b>1. Pre/perinatal items</b>						
1.1. Maternal substance use	.64 (.72)	.76 (.78)	1.13 (.78)	3.66*	H>L	.075
1.2. Pregnancy related complications	.61 (.77)	.62 (.65)	.87 (.68)	1.35	–	.024
1.3. Birth related complications	.14 (.42)	.56 (.70)	.50 (.73)	4.57*	H, M>L	.087
1.4. Low birth weight	.06 (.23)	.12 (.41)	.10 (.31)	0.34	–	.012
1.5. Premature birth	.11 (.32)	.09 (.29)	.10 (.31)	0.49	–	.001
<b>2. Socio-economic situations items</b>						
2.1. Low occupational status	.39 (.60)	.44 (.70)	.57 (.77)	.56		.009
2.2. Low family income	.25 (.50)	.35 (.60)	.47 (.68)	1.08a	–	.019
2.3. Poor parental education	.14 (.35)	.35 (.64)	.43 (.63)	3.37*a	H>L	.057
2.4. Familial adversities	.22 (.48)	.38 (.60)	.37 (.56)	0.90	–	.042
2.5. Economic dependency	.50 (.61)	.65 (.74)	.97 (.85)	3.43*	H>L	.068
<b>3. Family environmen items</b>						
3.1. Parents mental health problems	.50 (.84)	.44 (.70)	.67 (.88)	0.65	–	.011
3.2. Parents antisocial behaviours	.53 (.61)	.62 (.65)	1.07 (.69)	6.28**	H>M,L	.107
3.3. Criminal background of parents	.28 (.57)	.35 (.64)	.60 (.81)	1.99a	–	.044
3.4. Intimate partner violence	.42 (.73)	.29 (.63)	.37 (.72)	0.27	–	.008
3.5. Poor familial support	.39 (.73)	.41 (.66)	.57 (.86)	0.53	–	.015
3.6. Parental antisocial attitudes	.25 (.44)	.35 (.49)	.57 (.50)	3.61*a	H>L	.076
<b>4. Child psychological functioning items</b>						
4.1. Low verbal IQ	.61 (.69)	.50 (.61)	.67 (.55)	0.60	–	.016
4.2. Callous	.37 (.55)	.56 (.56)	.80 (.61)	4.55*	H>L	.090
4.3. Negative emotionality	.60 (.65)	.91 (.62)	1.03 (.76)	3.60*	H>L	.071
4.4. Daring/risk taking	76. (.61)	.91 (.67)	1.30 (.65)	5.83**	H>M,L	.092
4.5. Attention deficits	.20 (.53)	.47 (.75)	.90 (.84)	7.80**a	H>L	.146
4.6. Hyperactivity	.31 (.53)	.47 (.66)	.63 (.72)	2.08a	–	.043
<b>5. Parenting skills items</b>						
5.1. Hostile parenting	.11 (.40)	.15 (.36)	.50 (.63)	4.50*a	H>M,L	.122
5.2. Lack of consistent discipline	.29 (.57)	.65 (.64)	.60 (.67)	3.32	M>L	.055
5.3. Lack of positive involvement	.19 (.47)	.35 (.60)	23 (.43)	.077a	–	.024
5.4. Inadequate norms/rules	.11 (.32)	.29 (.52)	.20 (.41)	1.63a	–	.040

Note. Post-hoc analyses were conducted using Sheffe's test. H refers to the high-level group, M to the medium-level group and L to the low-level group.

\* p<.05

\*\* p<.01

(a) Welch statistic used due to assumptions of homogeneity of variance not met.

First, we examined the pre/perinatal section of the CRACOW instrument. Two of the five risk factors helped discriminate the three groups of children: the scores on the maternal substance use during pregnancy and on the birth related complications scales. Post-hoc analyses showed that the high-level group was more likely to have been exposed to maternal substance use than the low-level group ( $p < .05$ ). Furthermore, the high- and medium-level groups were more likely to have had birth related complications than the low-level group ( $p < .07$  and  $p < .05$ , respectively).

Next, we examined the items comprised in the socio-economic situation section of the CRACOW. The scores of two of the five items differed across the three groups. The total scores on the parental education and economic dependency scales statistically differed across groups. Children included in the high-level group were more likely than those in the low-level group to have caregivers with poor educational background as well as showing significant evidence of economic dependency (both at  $p < .05$ ).

Looking at the family environment, two of the six items helped identifying the three groups of preschoolers. Analyses of variance showed that the high-level group significantly differed from the low-level group ( $p < .05$ ) on parental attitudes. They also significantly differed from both the medium- ( $p < .05$ ) and low-level ( $p < .01$ ) groups on the measure of parent's antisocial behaviours. In both cases, the high-level group showed higher scores on the scales suggesting that their parents are more likely to manifest antisocial behaviours and antisocial attitudes.

The psychological functioning section of the CRACOW produced some of the most important differences across the three groups of preschoolers. The analysis of variance showed that the preschoolers in the high-level group were consistently higher than those in the low-level group on the measures of callousness ( $p < .05$ ), negative emotionality ( $p < .05$ ), daring/risk taking ( $p < .01$ ), and attention-deficits ( $p < .01$ ). The high-level group was also showing a marginally higher score than the medium-group on the measure of daring/risk taking ( $p < .06$ ). No significant differences were found for low verbal IQ and hyperactivity.

Finally, the last section of the CRACOW examined as part of this study, the parenting skills section, also revealed significant differences across groups. First, highly-aggressive children were more likely to have been exposed to hostile parenting than the medium- and low-level groups (both at  $p < .05$ ). Second, the children in the medium-level group were somewhat more likely to have been exposed to an inconsistent form of discipline compared to those in the low-level group ( $p = .55$ ). The difference was marginally significant and the interpretation of this result should be made accordingly.



**TABLE 5. DOMAINS OF RISK FACTORS AND TOTAL SCORE ON THE CRACOW**

	Low-level (n=36)	Med-level (n=34)	High-level (n=30)	F-Test (2, 99)	Post-hoc test	Partial Eta squared
<b>Domains of risk/needs factors</b>						
1. Pre/perinatal section	1.56 (1.32)	2.15 (1.69)	2.70 (1.51)	4.72*	H>L	.080
2. Socio-economic situation section	1.39 (1.61)	2.09 (2.43)	2.80 (2.57)	3.96*a	H>L	.060
3. Family environment section	2.36 (2.22)	2.47 (1.64)	3.84 (2.41)	4.81*	H>M, L	.095
4. Psychological functioning section	2.79 (1.63)	3.82 (2.07)	5.33 (2.52)	11.88***	H>M, L	.206
5. Parenting skills section	.72 (.91)	1.44 (1.42)	1.53 (1.22)	4.71*	H, M>L	.095
Total score CRACOW	8.83 (4.46)	11.97 (5.76)	12.11 (6.19)	14.84***	H>M>L	.228

Note. Post-hoc analyses were conducted using Sheffe's test. H refers to the high-level group, M to the medium-level group and L to the low-level group.

\* p<.05

\*\* p<.01

\*\*\* p<.001

(a) Welch statistic used due to assumptions of homogeneity of variance not met.

## Sections of the CRACOW

Next, we examined group differences on the total scores for each of the five sections of the CRACOW. Findings of the analyses of variance are reported in Table 5. The findings showed significant group differences on the total pre/perinatal risk scores ( $p<.05$ ). More specifically, post-hoc test showed that the high-level group had higher scores on the pre/perinatal scale than the low-level group ( $p<.05$ ). Similarly, group differences were also observed for the scores of the socio-economic situation section ( $p<.05$ ). More specifically, the high-level group showed higher scores than the low-level group ( $p<.05$ ), thus suggesting their dependency to be exposed to a higher number of social risk factors.

Furthermore, the three groups were also significantly different on the total score of the family environment ( $p<.05$ ). The analysis of variance and post-hoc tests revealed that the preschoolers in the high-level group were showing more risk factors representing a criminogenic family environment than those in the medium- and low-level groups (both at  $p<.05$ ). Significant group differences were also found for the psychological section ( $p<.001$ ). The high-level group showed a significantly higher score than both the medium- ( $p<.05$ ) and the low-level groups ( $p<.001$ ), thus suggesting that highly aggressive children were more likely to exhibit early deficits in this area of functioning.

Finally, the analysis of variance also indicated significant group differences for the parenting section of the CRACOW instrument ( $p<.05$ ). Indeed, both the high- and medium-level groups had higher scores than the low-level group ( $p<.05$ ) on the parenting section. In other words, the highly and occasionally aggressive children were more likely to have been exposed to parents showing inadequate/poor parenting skills than the low aggressive children. Not surprisingly, considering previous results, when looking at the total score for the CRACOW scale, significant differences were found between the three groups ( $p<.001$ ). The high-level group had more risk/needs factors than the medium-level ( $p<.05$ ) and the low-level group ( $p<.001$ ). Note that the medium-level group also showed a marginally higher score on the CRACOW than the low-level group ( $p<.07$ ).



## Screening Highly Aggressive Preschool Children

The postdictive screening accuracy of the CRACOW was examined in two ways. First, the total scores of each of the five domains of the CRACOW and the total score of the instrument were analyzed separately with respect to their correlation with the level of physical aggression. The aim of this procedure was to determine whether the scores on the instrument were linearly related to the frequency of physical aggression in the past year. To do so, the frequency of the four items of physical aggression (i.e., kick, push, fight, throw things) was summed to create a composite scale of physical aggression. Correlations between the scores of the CRACOW instrument and the composite score of physical aggression are reported in Table 6. The correlations between the domains of risk factors and physical aggression ranged between .23 for the family's socio-economic situation, and .59 for the child psychological functioning. The correlation between the total score of the CRACOW and the measure of physical aggression was moderate to substantial [ $r(100)=.54, p<.001$ ].

**TABLE 6. POSTDICTIVE ACCURACY OF THE CRACOW**

Domain	r	Précision postdictive		
		AUC	SE	Range
1. Pre/perinatal section	.30**	.68**	.06	.56-.79
2. Socio-economic situation section	.23*	.63*	.06	.52-.75
3. Family environment section	.26**	.65*	.06	.53-.77
4. Psychological functioning section	.59**	.74**	.06	.63-.84
5. Parenting skills section	.24*	.62*	.06	.50-.75
Total CRACOW score	.54***	.77***	.05	.67-.86

Note. N=100. Correlation (r) conducted by using a sum of the scores on the four items of physical aggression to create a composite measure of aggression as the criterion for these analyses. ROC (Receiver Operating Characteristics) curves were conducted by merging the low-level and the medium-level groups into one category and the high-level group in the other. Therefore, the ROC curves represent the ability of the items of the CRACOW in screening the highly aggressive children from the other children.

AUC = Area under the ROC curve. SE = Standard error of the AUC.

\*  $p<.05$

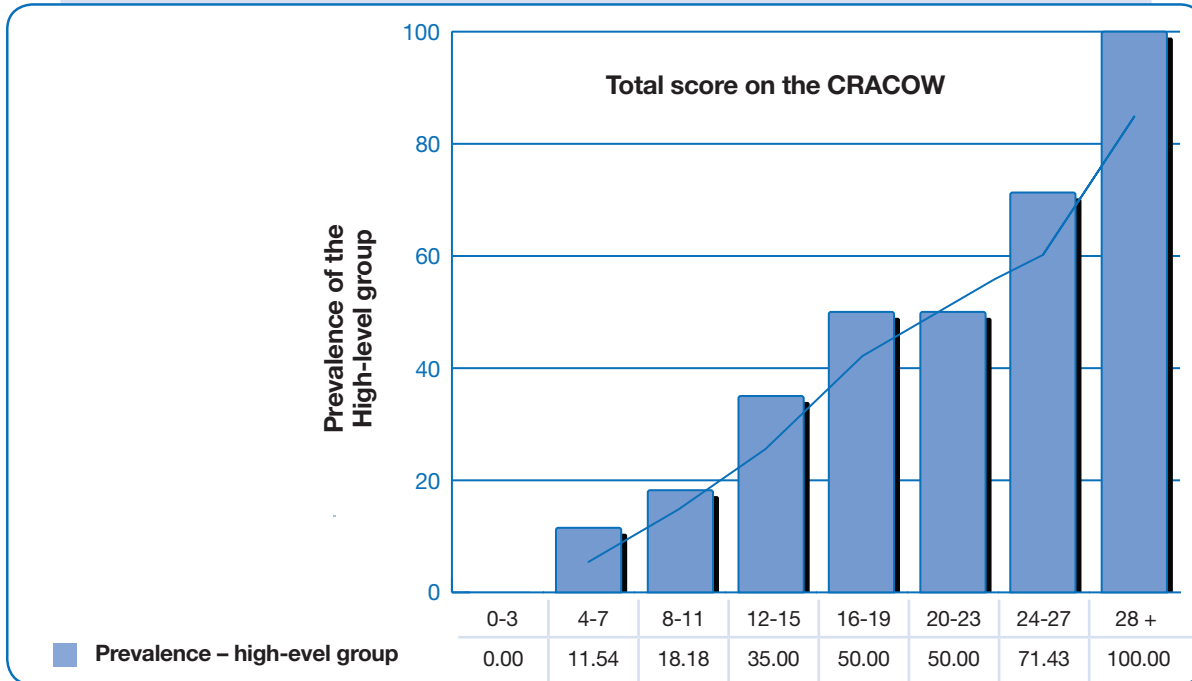
\*\*  $p<.01$

\*\*\*  $p<.001$

Next, the screening accuracy of the instrument was analyzed using a series of ROC (Receiver Operating Characteristics) curves. The total scores for each of the five domains and the total score of the CRACOW instrument were plotted individually against group membership to the high-level category of physical aggression. In order to conduct these analyses, the low-level and the medium-level groups were merged together. Therefore, the ROC curves were aimed at examining the postdictive screening accuracy of the instrument in identifying the highly aggressive children from the other preschoolers. Results are presented in the Table 6.

Most of the domains of risk factors included in the CRACOW instrument showed ROC curves in the .60s, suggesting modest predictive accuracy taken individually. The child psychological functioning section showed to be the most accurate domain by itself with an AUC in the mid-.70s. Not surprisingly, the total score of the CRACOW instrument showed the highest screening accuracy with an AUC of .77, thus showing modest-to-good postdictive accuracy. These results suggest that as the scores on the CRACOW are increasing, so are the probabilities of the child to be highly physically aggressive toward others (Figure 3).

**FIGURE 3. PREVALENCE OF THE HIGHLY AGGRESSIVE CHILDREN AND SCORES ON THE CRACOW**



We then tested whether the total scores and the screening ability of the CRACOW instrument might be influenced by possible confounding factors (Table 7). Therefore, a logistic regression model was conducted by examining the predictive accuracy of the total score of the CRACOW tool, while adjusting for the following covariates: (a) child’s gender; (b) child’s ethnic origin; and (c) whether the child was a clinical referral. The logistic model produced a good-fit of the data [-2LL=86.09, df=4,  $p < .001$ , Nagelkerke= pseudo  $R^2 = .32$ ]. This model showed that the CRACOW total scores can efficiently screen highly aggressive children, even after adjusting for those covariates. In fact, for every one-unit change on the scores of the CRACOW tool, the probabilities of the child being highly aggressive increased by a factor of 1.18 ( $p < .001$ ; range: 1.07-1.30), regardless of the child’s gender, ethnic origin and source (clinical referral or not). None of the three covariates were statistically significant at  $p < .10$ .

**TABLE 7. POSTDICTIVE ACCURACY OF THE CRACOW, ADJUSTING FOR COVARIATES**

Predictors	Log (b)	Précision postdictive		
		Odds ratio	95% (C.I.)	P value
CRACOW (total score)	.17 (.05)	1.18	1.07-1.30	.001
Child’s gender (male)	.09 (.52)	1.09	.39-3.02	.867
Source (clinical)	-.87 (.70)	.42	.11-1.66	.215
Ethnic origin (Caucasian)	-.78 (.51)	.46	.17-1.25	.129
Model goodness of fit	Nagelkerke $R^2$ .32	-2LL 86.09	Df 4	P value .000

Note. N=100.



## Discussion

The current study examined some of the properties of the CRACOW instrument with a small sample of at-risk preschoolers. The purpose of the study was to examine the level of physical aggression in two different at-risk samples (clinical and community) and to determine whether the CRACOW could identify the preschoolers showing the highest-level of physical aggression before school entry. The inclusion of a clinical sample enabled the examination of the nature and frequency of physically aggressive behaviours in children characterized by an externalizing spectrum disorder. In addition, the inclusion of an at-risk community sample permitted the assessment of physical aggression in children exposed to environmental adversities. In doing so, the research was designed to oversample children with a diversity of risk/needs factors thus allowing examining the role of various items of the CRACOW that may otherwise have a base rate too low to be analyzed with general populations of preschoolers.

### What Can We Tell About the Physical Aggression of At-Risk Children?

This study did not investigate trajectories of physical aggression, but the frequency of the behaviours at a specific time point early in the development. From that point on, the findings from longitudinal studies have suggested that, albeit within-individual changes, between-individual differences (or the rank-ordering of children in terms of their level of aggression) in physical aggression remain relatively stable during childhood<sup>53</sup>. Therefore, with a short follow-up period of a few years, it is expected from prior studies that the high-level group would still remain the group showing the highest level of physical aggression.

In the current study, the high-level group was more important in prevalence (30%) than typically reported in earlier investigations with general population data or samples drawn from low socio-economic neighbourhoods<sup>54</sup>. This is probably a result of our sampling which includes clinical cases and children from vulnerable neighbourhoods. Furthermore, the majority of the clinical cases, not surprisingly were found in the high-level cases. This result somewhat overshadows the fact that 70% of the high-level group consisted of preschoolers recruited in vulnerable neighbourhoods. The high-level group of preschoolers recruited in the community showed the same level of physical aggression than the clinical cases without having been referred to or assessed for their physical aggression.

Note that the CRACOW assessment tool was not affected by the over representation of clinical cases in the high-level group. In fact, after controlling for CRACOW scores in multivariate analyses, the differences between the clinical and the community groups were no longer statistically significant, suggesting that the between-individual differences responsible for the over-representation of clinical cases within the high-level group might have been accounted by the items included in the CRACOW instrument. It also suggests that the tool might have promising properties that would allow the assessment of both clinical and at-risk community cases of children. Further studies, however, will be needed to inspect these aspects of the CRACOW.

### What Are the Most Promising Risk/Needs Factors of the CRACOW?

The current findings were generally in line with previous longitudinal studies looking at the developmental risk factors of youth violence<sup>55</sup>. Considering that aggression is multidetermined, we would not expect large effect sizes from single items of the CRACOW assessment tool<sup>56</sup>. Taken individually, these between-individual differences accounted for a small but significant proportion of the level of physical aggression in early childhood. As such, the average partial eta squared (partial  $\eta^2$  (i.e., percent of variance uniquely accounted by the risk/needs factor) of the 26 items examined was .05 (SD=.04), and varied between .00-.15. The most significant risk/needs factors were: the presence of attention-deficits characteristics (partial  $\eta^2$ =.15); hostile parenting (partial  $\eta^2$ =.12); parents' antisocial behaviours (partial  $\eta^2$ =.11); birth-related complications (partial  $\eta^2$ =.09); child's callousness (partial  $\eta^2$ =.09); child's daring/risk taking characteristics (partial  $\eta^2$ =.09);

child's parents' antisocial attitudes (partial  $\eta^2=.08$ ); and maternal substance during pregnancy (partial  $\eta^2=.08$ ). These findings, therefore, depict the highly physically aggressive child as someone having been exposed to multiple risk factors before birth, coming from a criminogenic family environment characterized by poor parenting skills, having self-regulation difficulties and lacking concerns for others. Other significant factors were associated with physical aggression with effect sizes ranging from .06 to .07 (i.e., economic dependency, poor parental education, lack of a consistent discipline and the child's level of negative emotionality). Therefore, both the individual and familial risk/needs factors of the CRACOW tapped aspects of the highly physically aggressive children.

In sum, these findings might not come as a surprise to most developmental criminologists. While previous longitudinal studies have shown the role and importance these risk/needs factors have in middle/late childhood and adolescence, the current study shows that these risk items are operating sooner and can be detected early in the child's development with a rigorous risk/needs assessment tool. Furthermore, these risk/needs factors are operating on physical aggression in childhood, a significant and important precursor of youth violence.

### Is the CRACOW Capturing Risk Factors at the Earliest Developmental Stages?

From its onset, a rationale of the CRACOW was to capture the risk/needs factors of children at risk of youth violence at the earliest developmental stages<sup>57</sup>. More specifically, the CRACOW was designed to bridge gaps between the scientific literature from different disciplines (i.e., criminology, health and child psychiatry).

The current study shows promising findings supporting the value of a multidisciplinary perspective to approach the issue of youth violence. In that regard, the pre/perinatal risk/needs domain of the CRACOW was shown to help, albeit in conjunction with other risk domains, in the identification of the most physically aggressive children. The overall predictive accuracy was relatively modest, but similar to those observed for the familial environment domain of the CRACOW. Two items of the pre/perinatal showed more promising value in discriminating at-risk children in terms of their level of physical aggression. Maternal substance use refers to a series of unhealthy behaviours during pregnancy such as the use of tobacco, alcohol, soft/hard drugs, as well as non-prescribed medication. Birth complications, on the other hand, refer to problems occurring at the time of labour and delivery (e.g., the umbilical cord around baby's neck, the baby not breathing, convulsions, etc.). Although the causal mechanisms remain unclear, pre/perinatal factors such as those, can affect the brain development of the foetus resulting in subtle neuropsychological deficits. The use of nicotine, alcohol and drugs<sup>58</sup>, birth complications<sup>59</sup> and low birth weight<sup>60</sup> have all been shown to be linked to characteristics associated to a large array of negative outcomes such as aggression, antisocial behaviours and criminal behaviours. The effect sizes found, while significant, are not large<sup>61</sup>. One way to address this issue is to look at potential mediator and moderator factors<sup>62</sup>.

Pre/perinatal risk factors might prove more detrimental on the child's development when acting in combination with adversarial family factors<sup>63</sup>. This is consistent with the hypothesis that aggression and violence are best understood as an accumulation of risk factors than the result of a single set of risk factors operating. Maternal substance use and birth complications, therefore, might characterize at-risk pregnancies for highly aggressive children.

## Is the Cracow Capturing Familial Risk/Needs Factors of Physical Aggression?

Several aspects of the familial environment captured by the CRACOW helped distinguishing the highly physically aggressive children from the others. The highly physically aggressive children were exposed to more risk factors tapping into the economic deprivation of the family environment. They were also more likely to have been exposed to a criminogenic family environment characterized by poor parenting skills. Previous studies on the early familial risk factors of physical aggression have focused on the socio-economic characteristics and the parenting skills of the home environment. The presence of specific familial risk/needs factors have shown to be related to high levels of physical aggression during childhood, even when measured at the time of the child's birth<sup>64</sup>. For example, low maternal education has been shown to be linked to high-level of physical aggression<sup>65</sup>, and also to distinguish the children who remained highly aggressive throughout childhood and adolescence<sup>66</sup>. Those factors, therefore, might have an effect on both the onset and the persistence of high levels of physical aggression.

Previous studies also suggest that socioeconomic risk factors have a main effect that is not mediated by other family risk factors such as parenting<sup>67</sup>, something not explored in the current study. Furthermore, and in line with our findings, previous reports have shown that hostile (e.g., being annoyed or getting easily and promptly angry at the child) and coercive (e.g., raising voice, shouting, spanking/shaking child) parenting are typically associated with higher levels of early aggression<sup>68</sup>. Observational measures of maternal rejecting parenting (e.g., harsh, hostile, lack of warmth) have not been shown to be linked to initial level of overt antisocial behaviours, but helped distinguishing high-level desisters and chronic, with the latter group more subject to this type of parenting<sup>69</sup>. This result suggests that rejecting parenting behaviours might play a distinct role in the persistence of aggression.

The criminogenic aspect of the family environment has not been the subject of many empirical investigations. Tremblay et al. (2004) have shown that antisocial mothers are more likely to have highly aggressive children, which is in line with our findings. Based on these results, we can then conclude that the highly aggressive children are those exposed to a multitude of risk/needs familial factors. These risk/needs identified are both structural (i.e., socioeconomic situation) and dynamic (i.e., parenting skills) and may facilitate the intergenerational transmission of aggression and violence through the role and importance of the presence of a criminogenic environment.

## Is the Cracow Capturing Individual Risk/Needs Factors of Physical Aggression?

Not all children respond in the same way to their environment. Our study suggests that highly physically aggressive preschoolers present a constellation of psychological functioning difficulties. The child psychological functioning section of the CRACOW appeared as one of the most significant in distinguishing highly aggressive children from the other preschoolers. Our study indicates that highly aggressive children tend to show high levels of negative emotionality, daring/risk taking behaviours, and callousness. This constellation of difficulties is reminiscent of the propensity for disorderly conduct behaviours as proposed by Lahey and Waldman (2005). Negative emotionality refers to the tendency to experience, intensively and without provocation, negative mood/states and having difficulties in regulating those moods<sup>70</sup>. Daring/risk taking refers to behavioural disinhibition and the child's tendency for sensation and novelty seeking behaviours<sup>71</sup>. Callousness, consistent with Lahey and Waldman's (2005) conception of prosociality, refers to the child's tendency to disregard other people's feelings and emotions and to show less concern for others. This constellation of psychological functioning dimensions may lead to situations where children's interactions can quickly escalate to acts of physical aggression. While these three dimensions have been examined with older children and have been shown to be related to conduct disorder and antisocial behaviours<sup>72</sup>, few studies have examined whether these three features relate to physical aggression in preschoolers.

Previous studies have shown that the presence of a difficult temperament (e.g., easily upset, easy to calm, unstable mood) measured at five months can distinguish, with some reliability, highly aggressive children in early childhood<sup>73</sup>. Furthermore, observational measures of low behavioural inhibition have been shown to be linked to high levels and persistence of overt antisocial behaviour during early childhood<sup>74</sup>. Taken together, these behavioural manifestations suggest that these children might be more demanding, more subject to anger outburst, and, as a result, might exacerbate more hostile, negative reactions from the environment, including parents. This might explain why physically aggressive children are more likely to be subject to maternal hostility compared to their siblings<sup>75</sup>.

## Limitations

This empirical study is not without methodological limitations and the results should be interpreted accordingly. First, the analyses were based on a small sample of at-risk Canadian preschoolers. These results, therefore, cannot be generalized to preschoolers at large. While this may be interpreted as a limitation, the research design was not intended to capture a general representation of the population, but to oversample families and children at risk of showing high-levels of aggression, especially at the earliest developmental stages. Moreover, the current study was based on retrospective data, albeit using a short recall period (1 year) to minimize biases caused by poor memory recall with respect to the parent's assessment of physical aggression.

Furthermore, due to the cross-sectional nature of the data (at this point), the current study only examined the between-individual differences associated with physical aggression. Longitudinal studies with repeated measures of aggression will follow to determine the predictive validity of the instrument while inspecting its ability to detect within-individual changes in the level of aggression over time. Also, only one informant (i.e., primary caregiver) was used to measure the frequency of aggression. Consequently, some aggressive behaviour might have been overlooked, minimized, or simply not observed by the informant. Finally, the statistical power of the current study was characterized by the small sample size. As a result, only a few covariates were analyzed. Therefore, replication of these findings with a large sample of preschoolers using longitudinal data with multiple informants will be important in future studies to better understand the properties of the CRACOW assessment tool.



## Conclusion

In contrast to screening methods<sup>76</sup>, assessment tools, such as the CRACOW, aim to present a more extensive, comprehensive and individualized description of a youth. When looking at the aggressive behaviours in the past year of two selected at-risk samples of preschoolers, the CRACOW performed relatively well at identifying the most physically aggressive children. The findings further suggest that the instrument performed as well for the clinical and the at-risk community samples of children. The focus on preschoolers was pivotal in examining the properties of the CRACOW with this population as it characterizes a period where children learn to inhibit their aggressive behaviours and, as such, are likely to manifest some level of physical aggression before school entry.

The ability to screen and assess children at risk of future aggression at this developmental stage is a challenge but has crucial implications for both prevention and intervention. There is currently no comprehensive, reliable and valid risk/needs assessments tools designed to assess the likelihood of future violent behaviour that can be applied at some of the earliest developmental stages. Preliminary findings of this study suggest that the CRACOW show some promises in filling this gap. In fact, the CRACOW identified risk/needs factors that have been shown to be related to serious and violent delinquency during adolescence. It seems, therefore, that the risk/needs factors are operating earlier than criminologists might have believed until recently, as the focus for the understanding and the prevention of youth violence has often been put on the period of adolescence.





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