Canadian Adolescent Gambling Inventory (CAGI)

Phase III Final Report

Joël Tremblay, Ph.D

Randy Stinchfield, Ph.D

Jamie Wiebe, Ph.D

Harold Wynne, Ph.D

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1 Introduction

The development and psychometric evaluation of the Canadian Adolescent Gambling Inventory (CAGI) was undertaken in two phases. Phase I consisted of: (a) an examination of how problem gambling is conceptualized, defined and measured in the literature; and (b) the development of a new conceptual framework, definition and means of measurement. This phase of the research involved an extensive review of the literature, consultation with a panel of experts in the field and focus groups with adolescents. The result was the development of a new conceptual framework and operational definition and the development of a draft instrument for measuring problem gambling.

Phase II of the project involved the fine-tuning and testing of the validity and reliability of the instrument developed in Phase I. This was accomplished by testing both an English and French version on a sample of adolescents drawn from school populations in Manitoba and Québec. Data collection included a pilot test with 195 students from Manitoba and 277 students from Québec. This was followed by a general school survey with 2,394 students, a retest of 343 students from the general school survey, and clinical validation interviews with 109 students who initially participated in the general school survey.

The original Phase II research design proposed utilizing two external sources of data to interpret scale scores and establish cutscores for levels of risky gambling behaviour; namely youth in treatment for gambling problems and clinician's assessments. It is important to assess the classification accuracy of the instrument (i.e., sensitivity, specificity, positive and negative predictive values) for detecting 'problem gambling cases' against a reference standard such as a case assessed by an expert interviewer. During Phase II, we were unable to locate any 12–17 year olds in treatment for a gambling problem. As well, the clinical interviews with school students resulted in very few students being classified as problematic gamblers. Therefore, in the absence of external validation criteria and expert consensus, frequency distributions and measures of central tendency were used to determine 'abnormal' gambling behaviour for a school sample of gamblers. As such, cutscores and score interpretations provided by Phase II work were temporary. The results needed to be cross-validated with other relevant samples; particularly, samples that include youth with gambling problems.

Phase III addressed the limitation of Phase II by reaching a new sample of youth who were at greater risk of having problems with gambling (e.g., adolescents who were receiving treatment for substance abuse or were receiving services from youth centres) or who were experiencing problems with gambling.

In summary, the research objectives of Phase III are as follows:

1. To assess the classification accuracy of the CAGI (sensitivity, specificity, positive and negative predictive values) for detecting problem gambling behaviours against a clinical assessment.
2. To recalculate validity and reliability considering the addition of new cases recruited in Phase III.

2 Research Design and Methodology

2.1 Instruments

For Phase III data collection, the same instruments as the ones used during Phase II were used. Nonetheless, they are described here to facilitate the reader's comprehension. All questionnaires used can be found in the Appendix.

2.1.1 Canadian Adolescent Gambling Inventory (experimental version)

The Canadian Adolescent Gambling Inventory comprises 19 types of gambling or betting activities done during the last three months. Gambling or betting is defined as an activity "… when you bet or risk money or something of value to have a chance to win or gain money or something else of value". For each activity, the respondent had to indicate the frequency of the activity on a six-point scale (not in the past three months = 0; daily = 5) and the time spent in a typical week on each activity (hours and minutes). A synthesis question concerning the total amount of money the participant lost on gambling/betting during the last three months was then asked, followed by a complementary question concerning the value of objects lost on gambling/betting during the same period. Finally, 36 questions concerning the consequences of gambling/betting in different areas of life were asked. All items were responded to by four options concerning a rough estimate of frequency (never, sometimes, most of the time, almost always) or another more precise estimate of frequency (never 1–3 times, 4–6 times, 7 or more times). The number of consequence items is expected to be reduced via Phase III analysis.

2.1.2 Proxy gold standards

As illustrated in the Phase I report, there is no consensus about what is problematic gambling among youth. The difficulty in validating an instrument like the CAGI is that no benchmark exists against which to calibrate the newly developed instrument. As such, it is important to compare the CAGI to a number of different criteria described as 'proxy gold standards'. These proxy gold standards were used during the Phase II clinical interviews.

To reduce misunderstandings and to assure that ratings were based on a large knowledge of gambling activities for each participant, information was collected through an extensive 45- to 70-minutes clinical interview. The interview used is the same one developed for Phase II and inspired by work done by other researchers (Ladouceur, Ferland, Poulin, Vitaro, & Wiebe, 2005; Stinchfield, Govoni,

& Frisch, 2005). This involved collecting detailed information on gambling behaviours (e.g., types, frequency, amount of money, with whom, where), discussions with friends and family about gambling, significant other's opinions about gambling, the gambler's opinion of his/her own gambling habits (e.g., whether it is considered a problem or not) and his/her internal definition of 'gambling problem', desires to change gambling habits, efforts to stop, sources of revenue to gamble, behaviour after a loss or a win, gambling debts history, beliefs about strategies to increase winnings, strategies to control gambling/betting (setting a monetary or time limit), the capacity to respect these limits and, finally, how far gambling/betting habits has harmed or interfered with significant relationships and school/job performance. Clinicians were also encouraged to supplement the interview with their own questions (maximum of four additional questions) and record additional observations pertinent to problematic gambling behaviour. A copy of the interview can be found in the Appendix section of the report.

Based on information collected through this in-depth interview, the three proxy gold standards were rated—one by the adolescent and the two others by the interviewer. The proxy gold standards can be found in the Appendix section.

2.1.2.1 DSM-IV Pathological Gambling Criteria (self-rated)

The first criterion or proxy gold standard utilized is the DSM-IV pathological gambling measure, self-rated by the adolescent. While this is a valid measure for adults, the utility for adolescents is unknown. Research has highlighted the difficulty youth have in understanding questions assessing problem and pathological gambling (Ladouceur et al., 2005). Adolescents had to self-rate these criteria after the in-depth interview.

2.1.2.2 DSM-IV Pathological Gambling Criteria (clinician rated)

The second criterion or proxy gold standard utilized is the DSM-IV pathological gambling criteria, rated by the clinician. The clinician based his/her judgment on the qualitative information collected during the one-hour interview. As noted above, the major limitation of this approach is the questionable applicability of DSM criteria to youth.

For both ratings of DSM-IV's pathological gambling criteria (self-rated and clinician rated), a cut point of four or higher was selected as identifying pathological gambling for DSM-IV gold standards as proposed by many studies as more representative of pathological gambling (Jimenez-Murcia et al., 2009; Lakey, Goodie, Lance, Stinchfield, & Winters, 2007; Stinchfield, 2003; Stinchfield et al., 2005)

2.1.2.3 Clinician Rating of Adolescent's Gambling Severity (CRAGS)

The third criterion used is the rating made on the Clinician Rating of Adolescent's Gambling Severity (CRAGS) by the clinician at the end of the interview. This scale was developed in Phase II of the research project and provides an overall rating of severity on a continuum of categories (e.g., no gambling, no gambling problem, low gambling problem, moderate gambling problem, high gambling problem), with anchor points describing the clinical portrait of the adolescent at these different levels. The clinician rated the scale based on all of the information gathered during the interview.

2.1.2.4 Being in treatment for gambling habits

It would have been valuable to use a fourth criterion that included adolescents in treatment for gambling problems. Unfortunately, there was only one centre in Québec that offered this service as an adjunct to youth substance abuse specialized treatment. As we were unable to obtain youth in treatment specifically for gambling problems, we were therefore unable to use this criterion.

2.1.3 South Oaks Gambling Screen Revised for Adolescents

Winters, Stinchfield and Fulkerson (1993) revised the South Oaks Gambling Screen (SOGS) for adolescents. At the time (i.e., 1990), there was no well-researched instrument to identify adolescent problem gamblers. Therefore, Winters, Stinchfield and Fulkerson revised the most commonly used adult instrument of the day, the SOGS, for adolescents, calling it the SOGS Revised for Adolescents, or SOGS-RA. The investigators revised the SOGS by using a past-year time frame, changing the wording of items and response options to better reflect adolescent gambling behaviour and youth reading levels, eliminating two items that were viewed as having poor content validity for adolescents, and giving only one point for sources of borrowed money rather than nine points as is done with the SOGS. The SOGS-RA consists of 12 items. Reliability and validity coefficients were computed on 460 males aged 15–18. The SOGS-RA internal consistency reliability was alpha = .80. In terms of validity, the SOGS-RA was correlated with gambling activity (r = .39), gambling frequency (r = .54) and amount of money gambled in past year (r = .42) (Winters, Stinchfield & Fulkerson). Two scoring procedures have been used with the SOGS-RA and have come to be referred to as the SOGS-RA broad and narrow criteria (Winters, Stinchfield & Fulkerson; Winters, Stinchfield & Kim, 1995). The broad criterion is based on a combination of gambling frequency and SOGS-RA score. To be classified as a problem gambler under the broad criteria, the respondent has to gamble at least weekly and obtain a SOGS-RA score of two or more or gamble daily, regardless of SOGS-RA score (Winters, Stinchfield & Fulkerson). Under the SOGS-RA narrow criterion, a cutscore of four or more indicates a problem gambler, a score of two or three indicates an at-risk gambler, while a score of zero or one is a no-problem gambler (Winters, Stinchfield & Kim). The authors recommend using the SOGS-RA narrow criterion rather than the broad criterion for identifying adolescent problem gamblers.

2.1.4 Impulsivity: Five-items version of the Eysenck Impulsiveness Scale

The original Eysenck Impulsiveness Scale (Eysenck & Eysenck, 1978; Eysenck, Easting, & Pearson, 1984) contain 23 impulsiveness items. Vitaro and colleagues (1999) then extracted the five impulsiveness items that had the highest factor loadings on the original scale: (a) Do you generally do and say things without stopping to think?; (b) Do you often get into trouble because you do things without thinking?; (c) Are you an impulsive person (i.e., a person who uncontrollably reacts or does things immediately without any thought to the action or its consequences)?; (d) Do you usually think carefully before doing anything?; and (e) Do you mostly speak before thinking things out? The response format is binary (i.e., 'yes' or 'no'), with a 'yes' response scored as a 1 and a 'no' response scored as 0. The responses to the five items are then summed, giving a minimum score of 0 and a maximum score of 5. Internal consistencies for the original scale vary from 0.74 with pre-adolescent boys to 0.85 with

young adults males (Eysenck & Eysenck, 1978; Eysenck et al., 1984). The French five-items version had internal consistency scores of .69 (age 13) and .71 (age 14) (Vitaro, Arseneault, & Tremblay, 1999). Vitaro and colleagues reported a cutoff of two and higher as representing the 70th percentile.

Principal components factor analysis obtained from 885 participants from the actual study provide a one-factor solution, with only one factor with an eigenvalue > 1. The one factor solution explains 51% of the total variance and provides an acceptable internal consistency with Cronbach's alpha coefficient of .76. The mean for the sample is 2.32 with a standard deviation of 1.25 (min. = 0, max. = 5) and a skewness of .22, indicating a normal distribution of scores.

2.1.5 Risk taking: Modified version of the Youth Risk Behaviour Survey

Aklin and colleagues (2005) developed a modified version of the shortened version of the Youth Risk Behavior Surveillance System (YRBSS) that was developed by the Centres for Disease Control and Preventions (CDC), which measures the engagement of youth in risky behaviour in daily life (see www.cdc.gov for more information). The Aklin and colleagues version of the questionnaire is comprised of 10 items formatted with 'yes' or 'no' response choices, with a 'yes' response being given a score of 1 and a 'no' response scored as zero. The participant is asked if he/she engaged in the following behaviours recently: (a) drank alcohol (even one drink); (b) smoked a cigarette (even one puff); (c) used any illegal drug; (d) been in a physical fight; (e) gambled for real money; (f) ridden a bicycle or motorcycle without a helmet (even once); (g) ridden in a car without wearing a seat belt (even once); (h) stolen anything from a store; (i) had sexual intercourse without a condom (even once); and (j) carried a weapon such as a gun, knife or club outside of your home. Alkin and colleagues reported no validity data of the modified CDC questionnaire.

The research team decided to keep seven items out of the Aklin and colleagues version of the YRBSS. The item concerning gambling was not retained because of the redundancy with the purpose of the actual study, the item concerning weapons was not retained because of the weak probability of this reality in Canadian schools, and the item concerning the use of condoms was also deleted because of the unequal probability of the presence of sexual activity among adolescents between 12–18 years of age.

Principal components factor analysis obtained from 889 participants from the actual study reveals a two-factor solution, providing two eigenvalues > 1. In order to obtain only one score of Risk Taking concept, the two items presenting the lowest factor loadings in the one-factor solution were deleted (physical fights, cycling without helmet). The now five-item scale has only one factor with an eigenvalue over 1. This one-factor solution explains 44.0% of the total variance (factor loadings varying between 0.49 and 0.78). Internal consistency is a bit weak, with a Cronbach's alpha coefficient of .67. The mean for the sample is 2.04 with a standard deviation of 1.44 (min. = 0, max. = 5) and a skewness of .39, indicating a normal distribution of scores.

2.1.6 Decision-making subscale of the Children's Coping Strategies Checklist

The decision-making subscale of the Children's Coping Strategies Checklist (Ayers, Sandler, West, & Roosa, 1996) is composed of four Likert-type items with response choices presenting four levels (Never = 0; Sometimes = 1; Most of the time = 2; Almost always = 3) (Program for Prevention Research, 1999).

The Ayers team defined the decision-making process when faced with a problem as "planning or thinking about ways to solve the problem. It includes thinking about choices, thinking about future consequences, and thinking of ways to solve the problem. It is not simply thinking about the problem—but thinking about how to solve it. It involves the planning and *not* the execution of actions to solve the problem" (Program for Prevention Research, 1999). The authors reported an acceptable internal consistency, with a Cronbach's alpha of .72 and confirmatory factor analysis supporting a one-factor model for the subscale (Program for Prevention Research, 1999). Test-Retest reliability coefficient is .68 (Program for Prevention Research, 1999).

Principal components factor analysis obtained from 882 participants from the actual study provide a one-factor solution with only one factor with an eigenvalue over 1. The one-factor solution explains 70.2% of the total variance and provides a very good internal consistency, with a Cronbach's alpha coefficient of .86. The mean for the sample is 6.37 with a standard deviation of 3.12 (min. = 0, max. = 12) and a skewness of -.03, indicating a normal distribution of scores.

2.1.7 Self-efficacy

Self-efficacy is measured by a four-item subscale extracted from the Personal Efficacy Scale of the Measure of Perceived Control (Paulhus, 1983; Paulhus & Van Selst, 1990). The four items presenting the highest factor loadings were selected (Paulhus, 1983) and these items were confirmed with confirmatory analysis as best representing the latent concept of self-efficacy (Epstein, Griffin, & Botvin, 2002). Items are rated on a five-point Likert scale (Strongly disagree = 1; Disagree = 2; I don't agree or disagree = 3; Agree = 4; Strongly agree = 5).

Principal components factor analysis obtained from 889 participants from the actual study provides a one-factor solution, with only one factor with an eigenvalue over 1. The one-factor solution explains 57.1% of the total variance and provides an acceptable internal consistency, with a Cronbach's alpha coefficient of .75. The mean for the sample is 16.14 with a standard deviation of 2.69 (min. = 4, max. = 20) and a skewness of -1.29, indicating slightly skewed distribution of scores.

2.1.8 Self-control: Brief Self-Control Scale

The Brief Self-Control Scale (BSCS) (Tangney, Baumeister, & Boone, 2004) is a 13-item abbreviation of the Self-Control Scale that was developed to measure five domains of self-control: control over thoughts, emotions, impulses, performance regulation and habit-breaking. The 13 Likert-type items ask respondents to evaluate how each item reflects how they typically behave (Not at all like me = 1; Sometimes = 2; About half of the time = 3; Much of the time = 4; Very much = 5). Two studies conducted with more than 200 young adults provide good internal consistency (Cronbach's alpha of .83

and .85). The addition of item score provides a total varying between 13 and 65. Test-Retest coefficient at a three week interval (n = 233 participants) is .87 (Tangney et al., 2004).

Principal components factor analysis obtained from 644 participants from the actual study provides, when forced to produce only one factor as proposed by authors (Tangney et al., 2004), one factor explaining 31.2% of the total variance and providing an good internal consistency with Cronbach's alpha coefficient of .80. The mean for the sample is 43.41, with a standard deviation of 8.43 (min. = 15, max. = 63) and a skewness of -0.40, indicating a normal distribution of scores.

2.2 Phase III Target Group

During Phase II, following in-class administration of CAGI and upon student consent, researchers invited the highest frequency gamblers to participate in a clinical interview. In total, 109 students participated in the clinical interview (n = 44 from Manitoba and n = 65 from Québec). Many of those interviewed in Phase II were not retained for Phase III analyses. Reasons for elimination included reporting gambling on a fictitious gambling activity ('Blozito', n = 5), missing data from clinician rating of CRAGS and DSM-IV (n = 1), or too long a delay between class administration of CAGI and the clinical interview (n = 37). Sixty-six valid interviews were retained.

Table 2.0 shows the distribution of DSM-IV and CRAGS ratings among the 66 valid participants interviewed in Phase II. As mentioned earlier, a cutpoint of four and higher was selected as identifying pathological gambling for DSM-IV gold standards (Jimenez-Murcia et al., 2009; Lakey et al., 2007; Stinchfield, 2003; Stinchfield et al., 2005). As shown, few were in the 'pathological' classification (only two based on clinician opinion; one based on self-rated DSM-IV gold standard) and 14–16 were classified in a subpathological category with one to three symptoms. The CRAGS scores demonstrate the same tendency, with most of the cases being in the 'no gambling problem' (n = 48) and the 'low gambling problem' categories (n = 16). Only two cases were classified in the 'moderate gambling problem' category and nobody was classified as being in the 'high gambling problem' level.

Table 2.0: *DSM-IV and CRAGS Scores among Adolescents Interviewed in Phase II and Target Sample for Phase III*

DSM-IV # of symptoms	DSM-IV (self-rated)	DSM-IV (clinician rated)
0	49	50
1– 3	16	14
4+	1	2
Total	**66**	**66**

CRAGS levels	# of cases	Target sample for Phase III
No gambling problem	48	-
Low gambling problem	16	-
Moderate gambling problem	2	40
High gambling problem	0	40
Total	**66**	**80**

With enough cases in the no to low gambling problem categories from Phase II, Phase III aimed to obtain at least 40 students in each of the highest categories of the DSM-IV pathological gambling self- and clinician-rated gold standards (i.e., one to three symptoms or more than four symptoms); these same cases probably match to the moderate or high gambling problem categories of the CRAGS. We anticipated needing approximately 110 interviews to reach our desired sample.

2.3 Phase III Data Collection Procedures

Centres that specialize in adolescent substance abuse treatment and delinquency issues were specifically targeted. For practical reasons (coordination and budget reasons), Phase III data collection primarily occurred in the province of Québec. Recruitment occurred at Centre le Grand Chemin (Montréal, Trois-Rivières and Québec), Centre Dollard-Cormier (Montréal), Centre de réadaptation Ubald-Villeneuve (Québec), Centre de réadaptation en alcoolisme et toxicomanie de Chaudière-Appalaches (Québec), Centre de réadaptation Domrémy Mauricie – Centre du Québec (Mauricie), Pavillon Foster (Montréal), Portage (St-Damien de Buckland; Beaconsfield; Lac Echo; Elora, Ontario), Centre jeunesse de Québec – Institut Universitaire (Québec) and Centre jeunesse de Chaudière-Appalaches.

In each participating centre, new clients were screened during the admission process using the SOGS-RA. For the purposes of this study, as a mean of being more inclusive and to not miss a potential case, a score of three or more was used as a positive indicator of a potential gambling problem. All youth scoring three or more were informed of the study and, if interested, signed a form giving a research team member authorization to contact them. A slightly different screening procedure was used in the Centre jeunesse de Québec, where, as asked by the Centre's Ethics Board, both youth and parental consent were required for the adolescent to participate in the study.

Phase III interviewers consisted of clinicians working with adult problem gamblers and youth with substance abuse, two of the principal investigators, and research assistants with degrees in psychology and social work. All interviewers received a two-hour training session on conducting the interview and

rating the two clinician scales (DSM-IV pathological gambling criteria and CRAGS). The training was conducted by the principal investigator, Dr. Joel Tremblay, and the project coordinator, Annie-Claude Savard (a doctoral student in social work).

Once the consent form was signed, the participant responded to the CAGI as well as questions included in the draft CAGI that were not retained in the final CAGI produced in Phase II.[1] This part of the research (consent form and CAGI) took approximately 30 minutes (a copy of the consent form is in Appendix). At completion of the in-depth interview, the interviewer recorded additional observations and provided an overall rating of severity on the CRAGS and DSM-IV based on the information gathered. Participants also provided self-ratings on the DSM-IV criteria for pathological gambling. All interviews were recorded.

Data collection occurred from March 2008 to July 2009. Overall, 1,223 youth in 12 treatment centres were screened with the SOGS-RA. Of these, 63 adolescents scored three or more (see Table 2.1). Of these 63, 22 did not participate in the research for a number of reasons: seven refused, five were unavailable despite numerous attempts to arrange a meeting, two fled treatment, two had significant psychological difficulties that impeded their capacity to participate in a structured interview, and six had not gambled within the timelines for the study. In total, 41 youth participated in the interview process. Two of the 41 interviews were excluded because the accuracy of the responses could not be trusted.

Table 2.1: *Phase III Screening and Interviews*

Centre type	Number of SOGS-RA administered	Number of SOGS-RA positive (3+)	Among the 63 SOGS-RA positives screens		
			Refusal/ not reached	Interviews	
				Valid interviews	Excluded interviews
Outpatient services	855	18	7	11	0
Residential services	368	45	15	28	2
Total	**1,223**	**63**	**22**	**39**	**2**

Despite significant efforts, the goal we set to assess 110 cases was not reached. Nonetheless, the number of recruited cases was adequate to conduct Phase III validation analyses. In fact, most of the 39 recruited cases were in the range of problematic gambling. Using the DSM-IV proxy gold standards, between 35–37 cases presented at least one pathological gambling criterion. When using the CRAGS, 32 cases were in the moderate or high gambling problem levels. (See Table 2.2)

[1] At the Centre le Grand Chemin, the screening was already done with the DSM-IV-J-R. The research assistant then administered the SOGS-RA, the CAGI and the CAGI Supplement.

Table 2.2: *Distribution of the Phase III Cases*

DSM-IV # of symptoms	DSM-IV (self-rated)	DSM-IV (clinician rated)
0	2	4
1–3	12	7
4+	25	28
Total	**39**	**39**

CRAGS levels	Number of cases
No gambling problem	2
Low gambling problem	5
Moderate gambling problem	12
High gambling problem	20
Total	**39**

The clinical sample is a mix between the 66 cases recruited during Phase II and the 39 cases in Phase III, for a total of 105 cases distributed through the severity levels. For all these cases we had the three proxy gold standards scores: DSM-IV self-rated, DSM-IV clinician rated and CRAGS. Table 2.3 shows the distribution of cases composing the final clinical sample.

Table 2.3: *Distribution of the Global Clinical Interviews Sample (Phase II and Phase III Cases)*

DSM-IV # of symptoms	DSM-IV (self-rated)	DSM-IV (clinician rated)
0	51	54
1–3	28	21
4+	26	30
Total	**105**	**105**

CRAGS levels	Number of cases
No gambling problem	50
Low gambling problem	21
Moderate gambling problem	14
High gambling problem	20
Total	**105**

2.4 Participants Description/Clinical Interview Sample (Phase II and III)

Table 2.4 compares the demographic characteristics of participants recruited from Phase II and Phase III. Phase III participants are more often males (62% versus 49%), are slightly older (average 15.6 years versus average 14.9 years) and more frequently Caucasian (94.9% versus 77.3%). The total sample is well distributed between genders, school grades and age.

Table 2.4: *Demographics of Phase II and III Clinical Interview Participants*

Demographics	**Phase II (*n* = 66)**	**Phase III (*n* = 39)**	**Total (*n* = 105)***
Gender %			
Male	48.5	61.5	53.3
Female	51.5	38.5	46.7
Grade %			
Grade 7	7.6	2.6	5.7
Grade 8	13.6	23.1	17.1
Senior 1 (Secondary III)	7.6	30.8	16.2
Senior 2 (Secondary IV)	28.8	35.9	31.4
Senior 3 (Secondary V)	33.3	7.7	23.8
Senior 4**	3	-	1.9
Professional***	3	-	1.9
Age %			
12	1.5	0	1
13	12.1	2.6	8.6
14	10.6	15.4	12.4
15	21.2	23.1	21.9
16	25.8	38.5	30.5
17	24.2	17.9	21.9
18+	4.5	2,6	3.8
Ethnicity %			
Caucasian	77.3	94.9	83.8
Asian	3	0	1.9
Aboriginal/First Nations	6.1	2.6	4.8
Black	10.6	2.6	7.6
Hispanic	3	0	1.9
Do not know	1.5	0	1
Other	6.1	0	3.8

***** Totals may not equal 100% due to missing data. ****** *Senior 4* does not exist in Québec high schools. ******* 3% of Quebec students were enrolled in a professional program designed to create employment opportunities following graduation.

Table 2.5 examines the gambling involvement of Phase II and III clinical interview participants. The results highlight important differences between the school and treatment samples. Compared to Phase II participants, Phase III participants are more intense gamblers and represent the type of gamblers that were missing from our Phase II research.

The clinical sample gambles more frequently, with more than three quarters (78%) gambling two or more times a week, compared to less than 20% of the school sample who gamble this frequently. More than 50% of the Phase III sample reported gambling on eight types of gambling activities (cards for money, dice or board games, dare that you can do something, dare that someone else can do something, scratch tickets, sports pools, arcade/video games). This is in contrast to only two activities (dice/cards/board games; dares or challenges) that were engaged in by 50 % or more of the Phase II participants. Phase III participants spend much more time gambling than Phase II participants; 59% spend 10 hours or more per week compared to 3% of Phase II participants. When you consider the money spent on gambling, the difference is striking: 51.3% of the Phase III sample spent more than $200 during the last three months compared to only 4.5 % of the Phase II sample. In fact, 83.4% of Phase II youth participating in the clinical interview spent less than $40 on gambling in the three months preceding the interview.

Table 2.5: *Frequency Distribution of Gambling Participation among Phase II and Phase III Clinical Interview Participants*

Gambling participation	Phase II % (*n* = 66)	Phase III % (*n* = 39)	Total* % (*n* = 105)
Highest level of gambling frequency during past three months			
No gambling	0	0	0
Once per month	28.8	2.6	19
2–3 times per month	36.4	10.3	26.7
Once per week	16.7	10.3	14.3
2–6 times per week	15.2	53.8	29.5
Daily	3	23.1	10.5
Missing data	0	0	0
Gambling activities			
Dice/cards/board games**	53	-	33.4
Dice or board games***	-	71.8	26.7
Cards for money***	-	92.3	34.3
Scratch tickets	54.5	64.1	58.1
Dare or challenge that you can do something	53	76.9	61.9
Sports pools/games	28.8	53.8	38.2
Arcade/video games	28.8	51.3	37.2
Table games at casino	13.6	15.4	14.3
Sport select	12.1	25.6	17.3
Dare or challenge someone else can do something	43.9	69.2	53.4
Internet	7,6	30,8	16,3
Other	9.1	19.5	13.3
Raffle	22.7	30.8	25.7
VLTs	10.6	30.8	18.2
Slot machines	6.1	5.1	5.7
Lottery	30,3	38,5	33,3
Horse races	3	5.1	3.9
Bingo	10.6	30.8	18.2
Sports with a bookie	6.1	7.7	6.9
Own/someone else performance (games of skills)	36.4	64.1	46.7
Missing data	0	0	0
Time spent gambling in a typical week			
No gambling	-	-	-
Less than 15 minutes	27.3	0	17.1
Between16–60 minutes inclusive	13.6	0	8.6

Gambling participation	Phase II % (*n* = 66)	Phase III % (*n* = 39)	Total* % (*n* = 105)
Between 1–2 hours inclusive	16.7	2.6	11.4
Between 2–3 hours inclusive	12.1	10.3	11.4
Between 3–4 hours inclusive	9.1	2.6	6.7
Between 4–5 hours inclusive	7.6	2.6	5.7
Between 5–6 hours inclusive	1.5	7.7	3.8
Between 6–7 hours inclusive	0	2.6	1
Between 7–8 hours inclusive	1.5	2.6	1.9
Between 8–9 hours inclusive	0	5.1	1.9
Between 9–10 hours inclusive	1.5	5.1	2.9
Between 10–15 hours inclusive	3	20.5	9.5
Between 15–20 hours inclusive	0	10.3	3.8
Between 20–25 hours inclusive	0	7.7	2.9
Between 25–30 hours inclusive	0	5.1	1.9
Between 30–35 hours inclusive	0	7.7	2.9
More than 35 hours	0	7.7	2.9
Missing data	6.1	0	3.8
Money spent gambling during past three months (including objects of value)			
No money lost	7.6	2.6	5.7
Less than $10	34.8	0	21.9
$11–$20	16.7	2.6	11.4
$21–$30	16.7	5.1	12.4
$31–$40	7.6	0	4.8
$41–$100	6.1	15.4	9.5
$101–$200	1.5	23.1	9.5
$201–$500	4.5	28.2	13.3
$501–$1000	0	2.6	1
$1001–$5,000	0	15.4	5.7
More than $5,000	0	5.1	1.9
Missing data	0	0	2.9

* Totals may not equal 100% due to missing data. ** This item is included only in Phase II (n = 66). *** These items are included only in Phase III (n = 39).

Table 2.6 shows the endorsement of gambling consequence items by Phase II and III participants. Consistent with their gambling involvement, Phase III participants endorse substantially more consequences than the Phase II sample. Endorsement rates for Phase III participants ranged from 43.6% to 94.9% (with 21 items endorsed by more than 70% of participants). In contrast, endorsement rates for the Phase II sample ranged from 0% to 83.3%, with only 2 items endorsed by at least 70% of

participants. Some items are particularly illustrative of the differences between Phase II versus Phase III: stealing to gamble (0% for Phase II versus 84.6% for Phase III), feeling guilty about gambling behaviours (16.6% versus 82.1%) and gambling for longer periods than planned (13.6% versus 94.9%).

Table 2.6: *Endorsement Rates of Consequences Items by Phase II and Phase III Clinical Interview Participants*

Items	Clinical Interview		Clinical sample (n = 105)
	Phase II subsample (n = 39)	Phase III subsample (n = 66)	
How often have you thought about gambling/betting?	50 (75.8%)	37 (94.9%)	87 (82.9%)
How often have you talked about gambling/betting?	55 (83.3%)	36 (92.3%)	91 (86.7%)
How often have you taken money that you were supposed to spend on lunch, clothing, movies, etc., and used it for gambling/betting or for paying off gambling/betting debts?	9 (13.6%)	28 (71.8%)	37 (35.2%)
How often have you sold your personal property (such as CDs, a Game boy, etc.) to have money to gamble/bet or to pay off your gambling/betting debts?	2 (3%)	24 (61.5%)	26 (24.8%)
How often have you stolen money or other things of value in order to gamble/bet or to pay off your gambling/betting debts?	0 (0%)	33 (84.6%)	33 (31.4%)
How often have you owed money to people because of your gambling/betting?	8 (12.1%)	29 (74.4%)	37 (35.2%)
How often have you borrowed money from family, friends or others to gamble/bet?	14 (21.2%)	31 (79.5%)	45 (42.9%)
How often have you gambled/bet your winnings?	25 (37.9%)	32 (82.1%)	57 (54.3%)
How often have you gambled/bet more than you could really afford to lose?	8 (12.1%)	30 (76.9%)	38 (36.2%)
How often have you planned your gambling/betting activities?	26 (39.4%)	30 (76.9%)	56 (53.3%)
How often have you gambled/bet with more money than you intended to?	8 (12.1%)	36 (92.3%)	44 (41.9%)
How often have you gambled/bet for longer periods of time than you intended to?	9 (13.6%)	37 (94.9%)	46 (43.8%)
How often have you gone back another day to try to win back the money you lost while gambling/betting?	9 (13.6%)	34 (87.2%)	43 (40.9%)
How often have you hidden your gambling/betting from your parents, other family members or teachers?	9 (13.6%)	30 (76.9%)	39 (37.1%)
How often have you arrived late or skipped school because of your gambling/betting?	5 (7.6%)	21 (53.8%)	26 (24.8%)

Items	Clinical Interview		Clinical sample (n = 105)
	Phase II subsample (n = 39)	Phase III subsample (n = 66)	
How often have you spent time gambling/betting when you were supposed to be doing homework?	9 (13.6%)	24 (61.5%)	33 (31.4%)
How often have you skipped practice or dropped out of activities (such as team sports or band) due to your gambling/betting?	2 (3%)	17 (43.6%)	19 (18.1%)
In the past three months, how often have you felt that you might have a problem with gambling/betting?	6 (9.1%)	23 (59%)	29 (27.6%)
How often have you felt that you would like to stop betting money but didn't think you could?	6 (9.1%)	24 (61.5%)	30 (28.6%)
How often have you felt it would be better for your well being to stop gambling/betting?	16 (24.2%)	24 (61.5%)	40 (38.1%)
How often has your family or friends complained that you gamble/bet too much?	6 (9.1%)	17 (43.6%)	23 (21.9%)
How often has gambling/betting made you feel frustrated?	13 (19.7%)	32 (82.1%)	45 (42.9%)
How often has gambling/betting made you feel stressed?	10 (15.1%)	34 (87.2%)	44 (41.9%)
How often have you felt bad about the way you gamble/bet or what happens when you gamble/bet?	7 (10.6%)	27 (69.2%)	34 (32.4%)
How often have you felt guilty about how much money you have lost gambling/betting?	11 (16.6%)	32 (82.1%)	43 (41%)
How often have you felt sad or depressed about how much money you have lost gambling/betting?	10 (15.1%)	28 (71.8%)	38 (36.2%)
How often has your gambling/betting caused money problems for you?	7 (10.6%)	28 (71.8%)	35 (33.3%)
How often have you had difficulties paying your gambling/betting debts?	2 (3%)	18 (46.2%)	20 (19%)
How often has someone put pressure on you, in any way, to pay what you owe after you lost a gamble/bet?	2 (3%)	18 (46.2%)	20 (19%)
How often have you skipped family gatherings in order to gamble/bet?	1 (1.5%)	17 (43.6%)	18 (18.1%)
How often have you skipped get-togethers with friends in order to gamble/bet?	3 (4.5%)	23 (59%)	26 (24.8%)
How often has gambling/betting caused you problems in your friendships?	1 (1.5%)	28 (71.8%)	29 (27.6%)
How often has gambling/betting caused you problems in your family relations?	2 (3%)	21 (53.8%)	23 (21.9%)
How often have you gotten into trouble at school or work because of your gambling/betting?	3 (4.5%)	18 (46.2%)	21 (20%)

Items	Clinical Interview		Clinical sample (n = 105)
	Phase II subsample (n = 39)	Phase III subsample (n = 66)	
How often have you skipped hanging out with friends who do not gamble/bet to hang out with friends who do gamble/bet?	3 (4.5%)	25 (64.1%)	28 (26.7%)
How often have you gambled/bet mainly because your friends were gambling/betting?	17 (25.7%)	34 (87.2%)	51 (48.6%)

2.5 Inter-rater Agreement

Approximately 17% (n = 18) of the interviews from Phase II and Phase III were rated by a second independent professional (Randy Stinchfield and Annie-Claude Savard) to determine inter-rater agreement on the clinician ratings of DSM-IV symptoms and the CRAGS.

Kappa coefficients (Bakeman & Gottman, 1997) were calculated between each independent judge ratings and clinicians ratings for the same cases. These coefficients were calculated for DSM-IV pathological symptoms rated by the clinician and also for the CRAGS. Both gold standards were scored in a binary format (positive if 4+ for DSM-IV clinician rated; positive if moderate or high gambling problem for the CRAGS). A kappa value > .75 generally indicates 'excellent' agreement, a value between .40 and .75 indicates 'satisfactory' agreement, and a value < .40 indicates 'poor' agreement (Fleiss, Levin, & Paik, 2003).

Table 2.7: *Agreement between Independent Judges and Clinicians Rating of Gold Standards (Binary Scoring)*

Independent judge	Number of cases	Kappa coefficient	
		DSM-IV (clinician rated)	CRAGS
Judge 1	10	0.61	0.14
Judge 2	8	0.75	0.14

Table 2.7 indicates a satisfactory inter-judges agreement concerning the DSM-IV pathological symptoms, but a poor agreement concerning the CRAGS.

3 Results

3.1 Factor Structure

Building on the factor structure results obtained in Phase II, exploratory and confirmatory factor analysis was rerun by combining the clinical sample (n = 39) with the original Phase II school sample of gamblers (n = 864). These new cases provide important response variations but, at the same time, represent a small proportion of the sample.

3.1.1 Exploratory factor analysis

The 36 items common to Phase II and III were included in a Principal Component Analysis with varimax rotation. Based on the analysis of the scree plot and the observation of four factors with an eigenvalue > 1, three, four and five factor solutions were examined. A solution similar to the one obtained in Phase II emerged.

The final solution consists of four factors that retain the same labels used in Phase II: 'psychological consequences', 'social consequences', 'financial consequences' and 'loss of control' (simplified version of the original Phase II label, 'preoccupation and loss of control') (see Table 3.1). Psychological consequences consist of six items, with factor loadings ranging between .65 and .78. Five items form the social consequences subscale, with factor loadings varying between .58 and .81. The financial consequences subscale consists of seven items, with factor loadings varying between .59 and .72. While four of the financial consequences items also loaded on other factors, conceptually and statistically they fit best with the financial subscale. For instance, difficulties paying gambling debts, gambling causing money problems, stealing to pay gambling debts, and someone placing pressure on you to reimburse a gambling debt are clearly related to financial consequences. The fourth factor, loss of control, consists of four items, three of which load on other factors. The decision to retain these items under loss of control was based on the main loadings and conceptual reasoning.

Table 3.1: *Factor Loadings of the 21 Items in the Four-factor Solution*

Items	Psych. Cons. (6 items)	Soc. Cons. (5 items)	Fin. Cons. (6 items)	Loss of Control (4 items)
How often have you felt guilty about how much money you have lost gambling/betting?	.776			
How often have you felt sad or depressed about how much money you have lost gambling/betting?	.718	.365		
How often have you felt it would be better for your well being to stop gambling/betting?	.709			
How often has gambling/betting made you feel frustrated?	.705			
How often have you felt bad about the way you gamble/bet or what happens when you gamble/bet?	.685			.341
How often has gambling/betting made you feel stressed?	.649		.311	
How often have you skipped family gatherings in order to gamble/bet?		.824		
How often have you skipped practice or dropped out of activities (such as team sports or band) due to your gambling/betting?		.808		
How often have you skipped hanging out with friends who do not gamble/bet to hand out with friends who do gamble/bet?		.732	.334	
How often have you skipped get-togethers with friends in order to gamble/bet?	.364	.707		
How often has your family or friends complained that you gamble/bet too much?		.582		
How often have you sold your personal property (such as CDs, a Game boy, etc.) to have money to gamble/bet or to pay off your gambling/betting debts?			.715	
How often have you borrowed money from family, friends or others to gamble/bet?			.698	
How often have you taken money that you were supposed to spend on lunch, clothing, movies, etc., and used it for gambling/betting or for paying off gambling/betting debts?			.698	
How often have you had difficulties paying your gambling/betting debts?	.357		.662	
How often have you stolen money or other things of value in order to gamble/bet or to pay off your gambling/betting debts?		.394	.648	.327
How often has someone put pressure on you, in any way, to pay what you owe after you lost a gamble/bet?	.308	.366	.585	
How often have you planned your gambling/betting activities?				.761
How often have you gambled/bet your winnings?	.305			.703
How often have you gambled/bet for longer periods of time than you intended to?		.312	.372	.652
How often have you gambled/bet with more money than intended?	.392		.419	.579

Note: Psych. Cons. = psychological consequences; Soc. Cons. = social consequences; Fin. Cons. = financial consequences.

The four-factor solution explains 67.3% of the total variance. After orthogonal rotation (varimax), each factor explains between 12.7% and 19.3% of the total variance (see Table 3.2) and between 18.9% and 28.6% of the model variance, which illustrates a balanced weight distribution among the four factors.

Table 3.2: *Variance Explained by Each Factor*

Factor	Rotated eigenvalue	Total variance explained %	Model variance explained %
Psychological consequences (6 items)	4.05	19.28	28.65
Social consequences (5 items)	3.74	17.82	26.49
Financial consequences (6 items)	3.67	17.49	26.00
Loss of control (4 items)	2.66	12.69	18.86
Total	**14.13**	**67.28**	**100**

The correlations between the four factors are not excessively high (<.85), varying between .62 and .69 (Table 3.3) which means sharing around 38% and 47% of variance. This finding supports the presence of different factors, while at the same time indicating the possibility of a higher order factor regrouping them all under an umbrella concept.

Table 3.3: *Inter-factor Correlations of CAGI Factors (n = 759)*

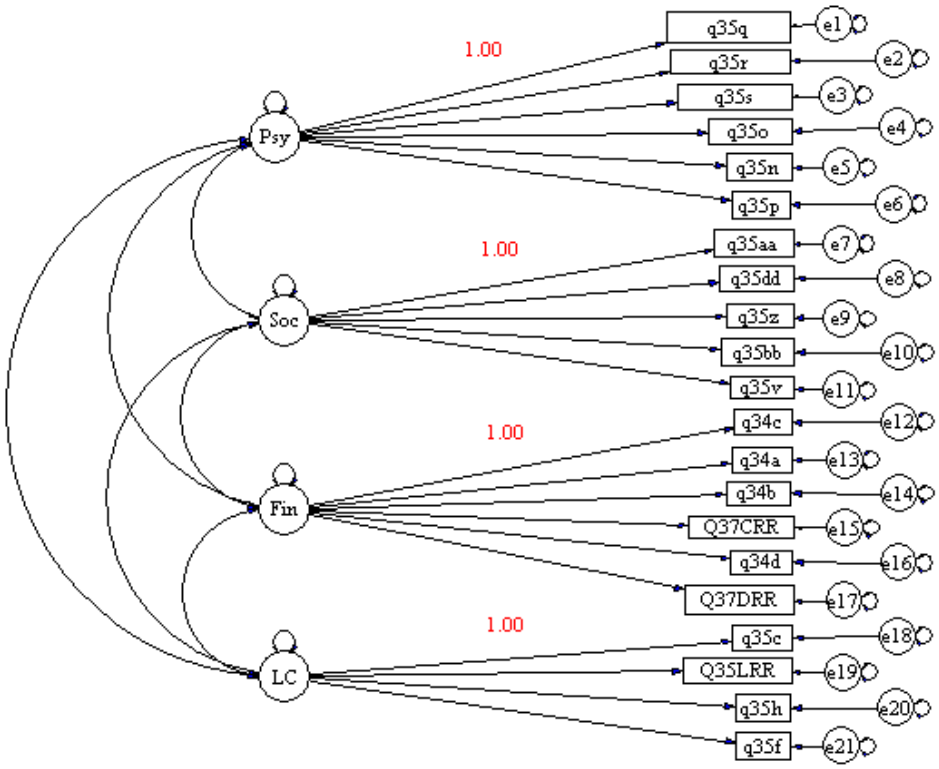
Factor	1	2	3	4
Psychological consequences (6 items)	-			
Social consequences (5 items)	.688**	-		
Financial consequences (6 items)	.618**	.633**	-	
Loss of control (4 items)	.658**	.615**	.654**	-

** $p < .01$

3.1.2 Confirmatory factor analysis[2]

Confirmatory factor analysis (CFA) was used to assess whether the four-factor model (see Figure 3.1) adequately fits the data. This analysis was also run to see if the hierarchical model (see Figure 3.2) provides a better fit. Models were fitted to the observed covariance matrix using the program 'Mx' (Matrix; Neale et al., 2003).[3] The maximum likelihood method was used to estimate the parameters.

Figure 3.1: *Four-factor Model*



[2] Usually, CFA is run with a new sample compared to the one used for exploratory factor analysis. Our sample was too small to go with this strategy, so CFA was run on the same sample as the one used for exploratory factor analysis. Consequently, CFA results must be interpreted cautiously and will need further validation with a new sample.

[3] The matrix is available from the authors upon request.

Figure 3.2: *Hierarchical Model*

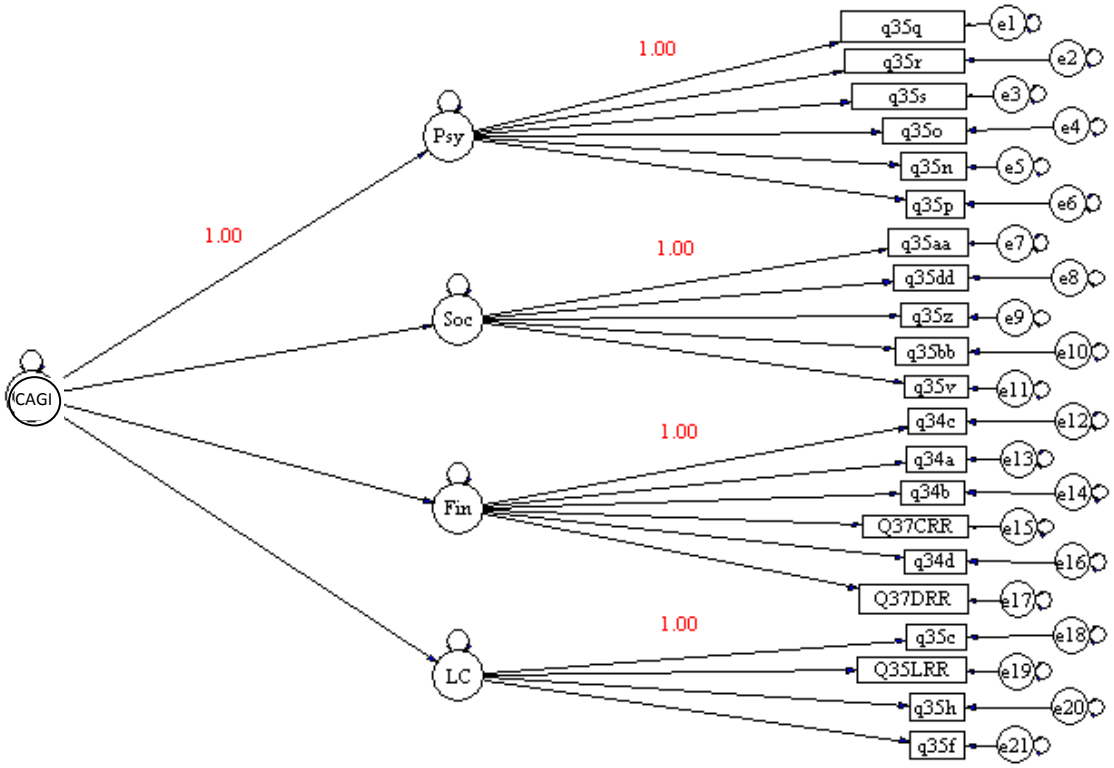


Table 3.4 shows the statistical indexes of overall model fit: model chi-square, root mean square error of approximation (RMSEA), comparative fit index (CFI), standardized root mean square residual (SRMR) and Akaike information criterion (AIC).

Table 3.4: *Statistical Indexes of Overall Model Fit*

	Null model	One factor	Four factor	Hierarchical
Chi-square	10,616.377	2,634.054	1,138.616	1,162.543
DF	210	189	183	185
p	0.000	0.000	0.000	0.000
RMSEA	0.256	0.131	0.083	0.083
CFI	-	0.765	0.908	0.906
SRMR	0.449	0.072	0.046	0.047
AIC	10,658.38	2,718.05	1,234.62	1,254.54

The model chi-square tests the null hypothesis that the model perfectly fits the data. It is the failure to reject the null hypothesis that supports the model. As pointed out by Kline (2005), the model chi-square is sensitive to the size of the correlations and sample size. The hypothesis tested is likely to be implausible. However, model chi-square is reported in virtually all reports of SEM analyses. The formulas of other indexes include model chi-square and the statistic is also useful in the comparison of nested models.

The RMSEA includes a built-in correction for model complexity and does not require a true null hypothesis that the model perfectly fits the data. It estimates the amount of error of approximation per model degree of freedom and takes sample size into account. A value of zero of the RMSEA indicates the best fit, with higher values indicating poorer fit. A rule of thumb is that RMSEA < .05 indicates a close approximate fit, values between .05 and .08 suggest reasonable error of approximation, and RMSEA > .10 suggests poor fit (Browne & Cudeck, 1993).

The CFI assesses the relative improvement in fit of the model compared with the null (independence) model (which assumes zero covariances among the 21 observed items). The CFI does not assume that the model perfectly fits the data. A rule of thumb for the CFI is that values greater than approximately .90 indicate reasonably good model fit (Hu & Bentler, 1999).

The SRMR is a measure of the mean absolute correlation residual (i.e., the overall difference between the observed and predicted correlations). A zero value indicates perfect model fit, with higher values indicating worse fit. SRMR values < .10 are generally considered favourable (Kline, 2005).

The AIC is used to select among competing non-nested models, which applies to the four-factor and hierarchical models. The model with the smallest AIC is chosen as the one most likely to be replicated. This represents the model with relatively better fit and fewer parameters compared to competing models. In contrast, more complex models with comparable overall fit may be less likely to replicate due to greater capitalization on chance.

The value of the SRMR and the CFI indicate a relatively good fit of the four factors. The RMSEA value of .083 is at an acceptable limit, suggesting a reasonable error of approximation for the four-factor solution. We can conclude that there is a relatively good fit between the four-factor model and the observed data, even if there is room for improvement. The four-factor model showed better fit than the null model or the one-factor model. As indicated by the AIC, the hierarchical model did not provide better predictive fit than the four-factor model.

It is important to note that a high proportion of scores for the 21 observed items are at the lower part of the Likert scale. As a result, fit indexes based on model chi-squares may be distorted as model chi-squares tend to be too high. All fit indexes in Table 3.4 include model chi-squares, with the exception of the SRMR, which indicates a relatively good fit.

Standardized and unstandardized estimates, along with 95% confidence intervals for the four-factor model, are shown in the Appendix A. Rather than using standards errors based on asymptotic

theory, 'Mx' computes likelihood-based confidence intervals through optimization. (Refer to Neale & Miller (1997) for a description of this procedure.)

Factor loadings for the four-factor model ranged from .60 to .88 (see Appendix A). All parameter estimates are significantly different from zero. Squared multiple correlations for all factor loadings ranged from .36 (i.e., 36% of variance in item q35s accounted for by the Psychological Consequences factor) to .78 (i.e., 78% of the variance in item q35z explained by the Social Consequences factor). The estimated correlations between the four factors are not excessively high (< .85).

In conclusion, the model presents a reasonably good fit—but at the limit of the acceptable range. The question of lack of variance in the response choices (tendency to select the lower frequencies) can partially explain this limitation.

3.2 Reliability

The internal consistency of the four factors is high, with Cronbach alphas ranging between .83 and .90 (see Table 3.5). Temporal stability is very good, with intraclass coefficients (ICCs) varying between .77 and .90.

Table 3.5: *Internal Consistency and Temporal Stability of the CAGI Factors*

Factor	Cronbach's alpha (n = 905)	Test-retest ICC (n)
Psychological consequences (6 items)	.90	.77 (62)
Social consequences (5 items)	.90	.90 (62)
Financial consequences (6 items)	.83	.83 (62)
Loss of control (4 items)	.87	.87 (62)

3.3 Gold Standards

As already mentioned, three separate measures comprised our gold standard of gambling severity: DSM-IV (clinician rated), DSM-IV (self-rated) and CRAGS (rated by the clinician).

Table 3.6 shows the correlations of these gold standard measures. As evidenced by correlations of .89 or greater, all three measures provide similar results.

Table 3.6: *Correlations between the Three Measures of Gambling Severity*

Gold standard	1	2	3
1. CRAGS	-		
2. DSM-IV (clinician rated)	.92**	-	
3. DSM-IV (self-rated)	.89**	.94**	-

** $p < .01$.

Table 3.7 shows the distribution of cases (moderate to high problem versus no to low problem) by gold standard. A strong agreement between the three indicators is observed. For instance, 30 participants were identified as moderate to high on the DSM-IV clinician rating; 30 received the same rating on the CRAGS and 24 from the DSM-IV self-rating. A total of 75 participants were rated as no-to-low problem on the DSM-IV Clinician rating; 70 were rated similarly by the CRAGS and 73 by the DSM-IV self-rating.

The next three tables illustrate a high congruency between the gold standards classification of cases.

Table 3.7: *Case Distribution by DSM Gold Standards*

DSM-IV (self-rated)	DSM-IV clinician rated	
	0–3 criteria	4–10 criteria
0–3 criteria	73	6
4–10 criteria	2	24

Table 3.8: *Case Distribution by DSM (Self-Rated) and CRAGS*

DSM-IV (self-rated)	CRAGS	
	No/low gambling problem	Moderate/high gambling problem
0–3 criteria	71	8
4–10 criteria	0	26

Table 3.9: *Case Distribution by DSM (Clinician Rated) and CRAGS*

DSM-IV (clinician rated)	CRAGS	
	No/low gambling problem	Moderate/high gambling problem
0–3 criteria	70	5
4– 10 criteria	1	29

3.4 Classification Analysis

The goal of the following analysis was to find the best set of items to classify cases between the three levels of severity of gambling problems (i.e., high severity, low-to-moderate severity, no problem levels). The symbolism of traffic light colours was used for this analysis. 'Red light' cases are those with high-severity gambling behaviour participants and are operationally identified by the DSM-IV pathological gambling gold standards as 'pathological' (four or more criteria) or with moderate or high gambling problems (i.e., CRAGS). The 'yellow light' cases are those presenting low- to moderate-severity gambling behaviours and are operationally identified when one to three symptoms are rated on any of the DSM-IV pathological gambling gold standards or when the CRAGS is rated at a low gambling problem level. All other cases—identified as 'green light' cases—are estimated as presenting no problem.

Because three levels of categorization is less common and received less empirical support, the analysis was conducted in steps, finding first the best items to divide the sample between red light cases and others. Then, once this group of items is identified, a subdivision will be done between green light and yellow light cases.

Table 3.10 presents a distribution of cases based on this dichotomous classification. A fourth global gold standard was created as a synthesis of the three others. Between 26–35 cases (depending on each gold standard) were in the problematic gambling (red light) level.

Table 3.10: *Dividing the Gold Standards between Problematic Gambling and Others*

Gold standard	**Negatives (green/yellow light cases) (number of cases)**	**Positives (red light cases) (number of cases)**
Clinician Rating Adolescent Gambling Severity (CRAGS)	No problem = 1 Low problem = 2–4 (71)	Moderate problem = 5–7 High problem = 8–10 (34)
DSM-IV Pathological Gambling Criteria (clinician rated)	0–3 criteria (75)	4–10 criteria (30)
DSM-IV Pathological Gambling Criteria (participant self-rated)	0–3 criteria (79)	4–10 criteria (26)
Three gold standards merged	No gold standard positive (70)	Any positive from the three gold standards (35)

Two types of statistical analysis were used to identify the set of items that best classify cases into the two categories proposed by each gold standard (see Table 3.10). First, discriminant function analysis (DFA) was used to determine which variables discriminate between two groups. DFA produces a canonical equation, giving to each item a selected weight, allowing the classification of cases based on the total equation. Because the research team chose not to use the weighted items, DFA was used only

as an exploratory strategy to select the best classification items. Following this step, another statistical strategy was used, receiver operating characteristic curve analysis (ROC; Obuchowski, 2003), to estimate the classification value of each group of items identified by DFA. ROC analysis allows the calculation of various validity scores (e.g., sensitivity, specificity, positive predictive value, negative predictive value, global classification accuracy).

3.4.1 Discriminant function analysis

Two DFA strategies were employed: a classical forward-stepwise analysis (i.e., including items one by one in the model until no more significant items could be included) and a backward-stepwise method (i.e., all variables are included in the model and then, at each step, the variable that contributes least to the prediction of group membership is eliminated). Both strategies were used to classify cases on scores of the three gold standards plus the added fourth merged gold standards variable.

The 36 items used in Phases II and III were entered into both DFA strategies and repeated four times (i.e. once for each gold standard). The variable(s) retained at each step are the ones that minimize the Wilks' Lambda. Criteria for inclusion is a $p < .05$ and for removing a variable $p > .10$. Table 3.11 shows the variable retained when using the classical forward-stepwise strategy.

Table 3.11: *Items Retained in a Forward-stepwise DFA Comparing Positive (Red Light) and Negative (Green/Yellow Light) Scores on the Gold Standards*

Variables	Standardized canonical discriminant function coefficients of retained variables for each gold standard			
	CRAGS	**DSM-IV (clinician)**	**DSM-IV (self)**	**Merged gold standards**
Q34_b: Taken money supposed to spend on lunch	.30			
Q34_d: Steal	.57	.41		.60
Q35_c: Planned your gambling	.32	.31		
Q35_j: Gone back to win back	.75	.50		.69
Q35_u: Hidden your gambling	.59	.63	.53	.56
Q35_v: People complained about your gambling	-.38			-.29
Q35_dd: Skipped activities to gamble	-.36			
Q36_a: Felt you might have a gambling problem		.41	.39	
Q37_brr: How often gambling caused money problems	-.43	-.58		-.34
Q37_e: Caused problems in friendship			.62	
Number of items retained (total of 10 distributed among the four solutions) and label of this solution	F-8	F-6	F-3	F-5
Groups centroids of function (top = negative; bottom = positive)	-1.37 2.85	-1.17 2.91	-.84 2.5	-1.15 2.30
Eigenvalue	3.92	3.46	2.17	2.70
Canonical correlation	.89	.88	.83	.854
% of cases correctly classified	95.2	97.1	93.3	93.3

Note: F-8 = a subscale composed of the eight items selected by DFA using a classical forward-stepwise strategy ('F' for forward) when trying to find the best classification items for CRAGS. F-6 = a subscale composed of the six items selected by DFA using a forward-stepwise strategy when trying to find the best classification items for DSM-IV pathological gambling criteria rated by the clinician, etc.

As seen in Table 3.11 above, DFA results proposed four different solutions that ranged between three and eight items. A 10-item solution (labelled F-10) was also retained, including all items selected through the four DFAs reported in the previous table.

Table 3.12: *Items Retained in a backward-stepwise DFA Comparing Positive (Red Light) and Negative (Green/Yellow Light) Scores on the Gold Standards*

Variables	Standardized canonical discriminant function coefficients of retained variables for each gold standard			
	CRAGS	**DSM-IV (clinician)**	**DSM-IV (self)**	**Merged gold standards**
Q34_b: Taken money supposed to spend on lunch	.40	.45	.25	.37
Q34_d: Steal	.49	.65		.54
Q35_f: Gamble with more money than intended	.31	-.37		
Q35_i: Gambled more than you can afford to loose		.55		
Q35_j: Gone back to win back	.60	.30		.63
Q35_k: Owed money to people	.36	-.35	-.36	
Q35_n: Felt bad about gambling			.44	.34
Q35_p: Gambling made you feel stress	-.40			-.28
Q35_q:Gambling made you feel guilty			-.41	
Q35_u: Hidden your gambling	.58	.81	.81	.66
Q35_v: People complained about your gambling	-.45	-.26		-.36
Q35_x: Gambling because of friends gambling		-.32		
Q35_z: Skipped hanging out with friends not gambling		.47	.57	
Q35_cc: Skipped homework to gamble			-.63	
Q35_dd: Skipped activities to gamble	-.33	-.63	-.40	-.41
Q36_a: Felt you might have a gambling problem	.42	.76	.27	.34
Q37_brr: How often gambling caused money problems	-.65	-.54		-.49
Q37_CRR: Difficulties paying your gambling debts	-.30	-.48		
Q37_e: Caused problems in friendship	.31	.37	.39	
Q37_f: Caused problems with family			.52	
Number of items retained (total of 20 distributed among the four solutions)	B-13	B-15	B-11	B-10
Groups centroids of function (top = negative; bottom = positive)	-1.47 3.08	-1,44 3.60	-1.05 3.20	-1.28 2.57
Eigenvalue	4.62	5.28	3.43	3.36
Canonical correlation	.91	.92	.88	.88
% of cases correctly classified	96.2	99.0	95.2	95.2

Note: B-13 = a subscale composed of the 13 items selected by DFA using a backward-stepwise strategy ('B' for backward) when trying to find the best classification items for CRAGS. B-15 = a subscale composed of the 15 items selected by DFA using a backward-stepwise strategy when trying to find the best classification items for DSM-IV pathological gambling criteria rated by the clinician, etc.

A backward-stepwise DFA strategy (see Table 3.12 above) identifies four different solutions that range between 10 and 15 items. A 15-item solution (labelled B-10) was also retained and included all items selected through the four DFAs reported in the previous table. A solution comprised of 13 items being selected by the three basic gold standards, without considering the merged gold standard, is also proposed (labelled B-13).

As previously mentioned, because of the absence of a recognized gold standard for pathological gambling among youth, there is no criterion to select one solution over another. Which set of items form the best classification subscale? Moreover, even if DFA proposes different solutions, the usefulness of these solutions in practice is not user friendly. In fact, to obtain the high classification accuracy proposed by each solution, a complex equation where each item score is multiplied by a coefficient and then added together must be used. In practice, we need a scale where items can be summed in a straightforward way—with a simple total and a cutoff point—to provide accurate classification information. This is why groups of items proposed by DFA were submitted to Receiver Operating Characteristic Curve analysis (ROC analysis).

3.4.2 ROC analysis

Classification accuracy is measured via a few concepts: sensitivity and specificity as the main ones, but also positive and negative predictive value. Sensitivity is the capacity of a test to identify true cases (or positive cases) in a population. In our situation, sensitivity is the ability of the CAGI or a CAGI subscale to identify the largest proportion of participants who have real problematic gambling tendencies as estimated through the gold standards. Specificity is the capacity of a test to identify negative cases. The challenge is to identify one solution that provides the best balance between sensitivity and specificity.

Each group of items has a different sensitivity and specificity at each potential cutpoint. To make sense of the massive amounts of information, one of the most useful non-parametric statistical tests is the well known Receiver Operating Characteristic (ROC) curve analysis (Zweig & Campbell, 1993). ROC analysis was developed as an effort to synthesize sensibility and specificity statistics into global information, helping researchers to arrive at better estimates of the classification accuracy of a test. The ROC curve is a plot of the sensitivity (Y axis) versus the false positive rate or 1–specificity (X axis) over all possible threshold values of the test (Fluss, Faraggi, & Benjamin, 2005). The ROC plot provides a view of the entire spectrum of sensitivities and specificities because all possible sensitivity/specificity pairs of a particular group of items are graphed (Zweig & Campbell, 1993).

The area under the curve estimates how far from chance the test identifies cases. The value of the area under the curve (AUC) varies between .5 (the equivalence of chance) and 1 (a perfect separation of the two groups via the test) (Zweig & Campbell, 1993). The area under the curve does not depend on a particular cutpoint, but from the entire plot. This allows for the comparison of the global accuracy of different subscales, aiding the decision between different solutions (DeLong, DeLong, & Clarke-Pearson,

1988). Finally, the Youden index identifies an optimal threshold (cutoff point) (Fluss et al., 2005). The Youden index varies between 0 (a null performance) and 1 (a perfect identification of all cases, i.e. sensitivity = 100% without having false positive cases).

ROC analysis has three main advantages. First, the calculation of the AUC does not vary with prevalence estimates. Second, the AUC is calculated while considering all possible cutoff points, while the percentage of accurate classified people is based on only one cutpoint. Third, an optimal equilibrium between sensitivity and false positive rate (1–specificity) is estimated (Obuchowski, 2003).

The following tables present the classification properties of various solutions previously identified through DFA. Table 3.13 presents solutions emerging from DFA stepwise forward, whereas Table 3.14 shows solutions from the DFA stepwise backward strategy.

The solutions presented in Tables 3.13 and 3.14 are highly different from chance in the ability to classify participants in the two groups created by each gold standard. The comparison between each one, using the comparison of the AUC, provides no significant difference (DeLong et al., 1988). All statistics are calculated using ROC-Tools, v1.0.2 (Allaire & Cismaru, 2007).

Table 3.13: *Classification Qualities of Groups of Items Identified with DFA Forward Stepwise*

		Cutoff[a]	YI	Se.	Spec.	AUC
F-8	CRAGS	7 or higher	.79	.82	.97	.97
	DSM-IV-CR	7 or higher	.86	.90	.96	.96
	DSM-IV-SR	7 or higher	.80	.88	.91	.95
	Merged	7 or higher	.77	.80	.97	.95
Mean			***0.81***	***.85***	***.95***	***6***
F-6	CRAGS	6 or higher	.84	.85	.98	.98
	DSM-IV-CR	6 or higher	.86	.90	.96	.97
	DSM-IV-SR	6 or higher	.80	.88	.91	.95
	Merged	6 or higher	.81	.83	.98	.96
Mean			***0.83***	***.87***	***.96***	***.96***
F-3	CRAGS	3 or higher	.77	.82	.94	.94
	DSM-IV-CR	3 or higher	.83	.90	.93	.96
	DSM-IV-SR	3 or higher	.82	.92	.90	.96
	Merged	3 or higher	.74	.80	.94	.93
Mean			***0.79***	***.86***	***.93***	***.95***
F-5	CRAGS	4 or higher	.84	.91	.93	.98
	DSM-IV-CR	4 or higher	.83	.93	.89	.96
	DSM-IV-SR	4 or higher	.77	.92	.85	.95
	Merged	4 or higher	.81	.89	.93	.96
Mean			***0.81***	***.91***	***.90***	***.96***
F-10	CRAGS	7 or higher	.81	.85	96	.97
	DSM-IV-CR	7 or higher	.88	.93	95	.96
	DSM-IV-SR	7 or higher	.82	.92	.90	.96
	Merged	7 or higher	.79	.83	.96	.95
Mean			***0.83***	***.88***	***.94***	***.96***

[a] For each gold standard, the best cutoff is estimated with the Youden Index. Given that it is not possible to estimate the total classification power of a subscale using different cutpoints through the gold standards, a uniformized best cutoff is selected based on the most frequent one.

Note: YI = Youden Index; Se. = sensitivity; Spec. = specificity; AUC = area under the curve.
All areas under the curve are significant at $p < .00001$.

Table 3.14: *Classification Qualities of Groups of Items Identified with DFA Backward Stepwise*

		Cutoff[a]	YI	Se.	Spec.	AUC
B-13	CRAGS	9 or higher	.81	.88	.93	.97
	DSM-IV-CR	9 or higher	.84	.93	.91	.96
	DSM-IV-SR	9 or higher	.78	.92	.86	.96
	Merged	9 or higher	.79	.86	.93	.95
Mean			***0.81***	***.90***	***.91***	***0.96***
B-15	CRAGS	10 or higher	.85	.88	.97	.97
	DSM-IV-CR	10 or higher	.88	.93	.94	.97
	DSM-IV-SR	10 or higher	.82	.92	.90	.96
	Merged	10 or higher	.83	.86	.97	.96
Mean			***0.85***	***.90***	***.95***	***0.97***
B-11	CRAGS	6 or higher	.81	.88	.93	.95
	DSM-IV-CR	6 or higher	.84	.93	.91	.96
	DSM-IV-SR	6 or higher	.78	.92	.86	.96
	Merged	6 or higher	.79	.86	.93	.94
Mean			***0.81***	***.90***	***.91***	***0.95***
B-10	CRAGS	5 or higher	.81	.94	.87	.96
	DSM-IV-CR	5 or higher	.81	.96	.84	.96
	DSM-IV-SR	5 or higher	.76	.96	.80	.95
	Merged	5 or higher	.79	.91	.87	.94
Mean			***0.79***	***.96***	***.84***	***0.95***
B-15b	CRAGS	10 or higher	.81	.85	.96	.97
	DSM-IV-CR	10 or higher	.83	.90	.93	.96
	DSM-IV-SR	10 or higher	.82	.92	.90	.96
	Merged	10 or higher	.79	.83	.96	.95
Mean			***0.81***	***.88***	***.94***	***0.96***

[a] For each gold standard, the best cutoff is estimated with the Youden Index. Given that it is not possible to estimate the total classification power of a subscale using different cutpoints through the gold standards, a uniformized best cutoff is selected based on the most frequent one.

Note: YI = Youden Index; Se. = sensitivity; Spec. = specificity; AUC = area under the curve.
All areas under the curve are significant at $p < .00001$.

The examination of the mean results of sensitivity and specificity scores revealed that we obtained many good solutions. But the necessity to optimize the classification power of the test conducted encouraged the team to try different other groups of items. We replaced some of the items previously identified by DFA with similar ones to test their respective classification capacities, and we were cognizant of the merit of having items representing each concept composing the CAGI (i.e., the psychological, social and financial consequence subscales and the loss of control subscale). This process

of trying many solutions permitted the identification of groups of items with a better classification performance then the one reported in Tables 3.13 and 3.14. The next table presents the value of two excellent solutions. Youden index scores are, as a mean, superior to the one obtained in the solutions presented in Tables 3.13 and 3.14 (the Youden index is calculated with sensitivity and specificity scores).

Table 3.15: *Classification Qualities of Two Other Solutions*

		Cutoff[a]	**YI**	**Se.**	**Spec.**	**AUC**
O-9	CRAGS	6 or higher	.87	91.2	95.8	.97
	DSM-IV-CR	6 or higher	.90	96.7	93.3	.96
	DSM-IV-SR	6 or higher	.85	96.1	88.6	.96
	Merged	6 or higher	.84	88.6	95.7	.95
Mean			***0.87***	***93.15***	***93.35***	***0.96***
O-7	CRAGS	5 or higher	.90	94.1	95.8	.98
	DSM-IV-CR	5 or higher	.89	96.7	92.0	.97
	DSM-IV-SR	5 or higher	.83	96.1	87.3	.95
	Merged	5 or higher	.87	91.4	95.7	.96
Mean			***0.87***	***94.58***	***92.7***	***0.96***

[a] For each gold standard, the best cutoff is estimated with the Youden Index. Given that it is not possible to estimate the total classification power of a subscale using different cutpoints through the gold standards, a uniformized best cutoff is selected based on the most frequent one.

Note: YI = Youden Index; Se. = sensitivity; Spec. = specificity; AUC = area under the curve.
All areas under the curve are significant at $p < .00001$.

O-7 = other group of seven items composed of q34_b (taken money supposed to spend on lunch), q34_d (stealing), q34_c (planning gambling), q35_n (felt bad about gambling), q35_j (gone back to win back), q35_u (hidden gambling activities) and q36_a (felt might have a gambling problem).

O-9 = other group of nine items composed of same items as in O-7 plus q35_dd (skipped activities to gamble) and q35_z (skipped hanging out with friends who do not gamble).

The two solutions, O-9 and O-7, are equivalents. The O-9 is preferred because of the higher number of items spread among the four factors previously identified. Based on all of the analysis, the decision is to retain the O-9 subscale with the label of Gambling Problem Severity Subscale (GPSS) of the CAGI.

Figure 3.3 illustrates the AUC plotting the relationship between sensitivity and the false positive rates calculated by the 1–specificity equation. This is done for each possible score on the nine-item GPSS compared to the DSM-IV clinician-rated gold standard.

Figure 3.3: *ROC Curve of the Gambling Problem Severity Subscale (Nine Items) Compared to the DSM-IV Clinician Ratings*

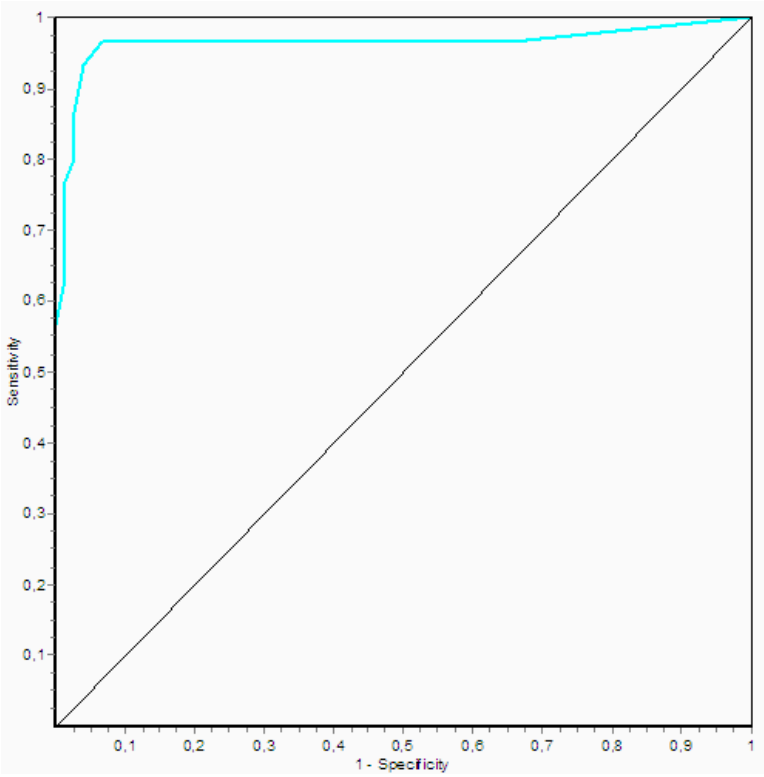


Table 3.16 provides the information needed to select the best cutscore of the GPSS. As shown, the means of the Youden Indexes pointed to a cutscore of 6.

Table 3.16: *Classification Qualities for Three Different Cutoff Scores for the Gambling Problem Severity Subscale*

		Cutoff[a]	YI	Se	Spec.	AUC	PPV	NPV
GPSS	CRAGS	5 and higher	.88	94.1	94.4	.97	.89	.97
	DSM-IV-CR	5 and higher	.87	96.7	90.7	.96	.81	.99
	DSM-IV-SR	5 and higher	.82	96.1	86.1	.96	.69	.99
	Merged	5 and higher	.86	91.4	94.3	.95	.89	.96
Mean			***0.86***	***94.58***	***91.38***	***0.96***	***0.82***	***0.98***
GPSS	CRAGS	6 and higher	.87	91.2	95.8	.97	.91	.96
	DSM-IV-CR	6 and higher	.90	96.7	93.3	.96	.85	.99
	DSM-IV-SR	6 and higher	.85	96.1	88.6	.96	.74	.99
	Merged	6 and higher	.84	88.6	95.7	.95	.91	.94
Mean			***0.87***	***93.15***	***93.35***	***0.96***	***0.85***	***0.97***
GPSS	CRAGS	7 and higher	.83	85.3	97.2	.97	.94	.93
	DSM-IV-CR	7 and higher	.89	93.3	96	.96	.90	.97
	DSM-IV-SR	7 and higher	.84	92.3	91.1	.96	.77	.97
	Merged	7 and higher	.80	82.9	97.1	.95	.95	.92
Mean			***0.84***	***88.45***	***95.35***	***0.96***	***0.89***	***0.95***

[a] For each gold standard, the best cutoff is estimated with the Youden Index. Given that it is not possible to estimate the total classification power of a subscale using different cutpoints through the gold standards, a uniformized best cutoff is selected based on the most frequent one.

Table 3.17 lists the items and regroups them through the categorization obtained via factorial analysis. Six out of the nine items of the GPSS were already included in the four-factor solution, but three were not; these three items were retained because of their important classification power. The team tested their possible inclusion in the previous four factors by rerunning principal component analysis, including these new three items. The results (see Table 3.17) were not convincing. One item, q35_j (gone back to win back money lost), had the highest factor loading on the social consequences factor instead of the loss of control factor as originally conceptualized. Two other items, q36_a (felt you might have a problem with gambling) and q35_u (hidden your gambling from family/parents), loaded highest on the factors that one would expect—psychological and social consequences, respectively—but the presence of double or triple significant saturation coefficients shows that they are not uniquely related to one factor. For these reasons, the decision was made to not include these items in the four factors calculation.

Table 3.17: *CAGI's Gambling Problems Severity Subscale Composition*

Subscales of the CAGI	Items already in the four factor solution	Items not included in the four factor solution	Results if included in the principal component analysis
Psychological consequences subscale	q35_n: How often have you felt bad about the way you gamble/bet or what happens when you gamble/bet?		
		q36_a: In the past three months, how often have you felt that you might have a problem with gambling/betting?	Factor loadings: • .478 in psychological consequences • .395 in financial consequences
Social consequences subscale	q35_dd: How often have you skipped practice or dropped out activities (such as team sports or band) due to your gambling/betting?		
	q35_z: How often have you skipped hanging out with friends who do not gamble/bet to hang out with friends who do gamble/bet?		
		q35_u: How often have you hidden your gambling/betting from your parents, other family members or teachers?	Factor loadings: • .404 in social consequences • .341 in financial consequences • .362 in loss of control
Financial consequences subscale	q34_d: How often have you stolen money or others things of value in order to gamble/bet or pay off your gambling/betting debts?		
	q34_b: How often have you taken money that you were supposed to spend on lunch, clothing, movies, etc., and used it for gamble/bet or to pay off your gambling/betting debts?		
Loss of control subscale	q35_c: How often have you planned your gambling/betting activities?		
		q35_j: How often have you gone back another day to try to win back the money you lost while gambling/betting?	Factor loadings: • .470 in social consequences • .437 in loss of control • .393 in financial consequences • .329 in psychological consequences

3.4.3 Determination of cutpoint between no problem (green light) and low-to-moderate severity (yellow light) cases with the Gambling Problem Severity Subscale

The main goal of this research was to produce a test with a strong capacity to discriminate between problematic gambling versus nonproblematic gambling behaviours. For this reason, the first classification efforts focused on identifying the group of items that best differentiated adolescents presenting problematic gambling behaviours from those who do not. That being said, as specified in Phase II, gambling problems lie on a continuum. Thus, efforts were taken to find a second cutpoint allowing the discrimination between the nonproblematic group and the group presenting low-to-moderate severity gambling behaviours.

The main hurdle is identifying a gold standard for low-to-moderate severity gambling behaviours. The research team chose to work with a combination of the gold standards, specifically, an extension of the previous grouping done and reported at the beginning of this section (see Table 3.10). That is, all cases rated positive on a least one gold standard are rated as problematic (red light) cases. Being positive on a gold standard means one or more of the following: presenting four or more criteria for pathological gambling on the self-rated or clinician rated DSM-IV grids, or presenting a score of five or more on the CRAGS (i.e., moderate or high gambling problem). Yellow-light cases, in turn, are defined by being in the subpositive range for the DSM-IV related gold standard (one to three diagnostic criteria), or being rated in the low gambling problem level of the CRAGS, without being positive on any gold standard. All other cases are classified in the no problem (green light) level (see Table 3.18).

Table 3.18: *Dividing the Gold Standards between High Severity, Low-to-Moderate Severity and No Problem Categories*

Gold standard	**Zero criterion through gold standards**	**Subpositive gold standards**	**Positive gold standard**
	No problem (green light) (number of cases)	**Low-to-moderate severity (yellow light) (number of cases)**	**High severity (red light) (number of cases)**
Clinician Rating of Adolescent Gambling Severity (CRAGS)	No problem = 1 (50)	Low problem = 2–4 (21)	Moderate problem = 5–7 High problem = 8–10 (34)
DSM-IV Pathological Gambling Criteria (Clinician Rating)	0 criterion (54)	1–3 criterion (21)	4–10 criterion (30)
DSM-IV Pathological Gambling Criteria (Participant Self-Rating)	0 criterion (51)	1–3 criterion (28)	4–10 criterion (26)
Three gold standards merged	No gold standard positive Zero symptoms endorsed on DSM-IV measures CRAGS = No problem (44)	No positive or red light cases, but at least one yellow light case from the three gold standards (26)	Any positive or red light case from the three gold standards (35)

Table 3.19 illustrates how misleading a two-level classification could be, particularly concerning the low-to-moderate severity cases. Nearly 90% (88.5%) of these cases would be rated as nonproblematic with a binary classification.

Another option is to use a three-level classification, where GPSS scores of 0 are rated as no problem (green) cases, scores of 1–5 are rated as low-to-moderate severity (yellow) cases, and all others are rated as high severity (red) cases. The limitation with this scenario is the high number of false positives (52.3%) among the no problem cases. On the other hand, a strength is that 69.2% of low-to-moderate cases are properly classified, only 2.9% of the red light cases are rated at the green light level, while the other 8.6% of misclassified high severity cases are placed in the low-to-moderate severity category.

Solution A produces an unacceptable number of false positive cases among the no problem category. The final solution (Solution B) proposes a classification rate of 86.4% accuracy for no problem cases, 50% for the low-to-moderate severity cases, and the same 88.6% for the high severity cases. This solution is preferred, considering the high volume of no problem cases.

A final three-level categorization for the GPSS is retained, with scores of 0–1 representing the no problem level, 2–5 the low-to-moderate severity level, and scores of 6+ the high severity level.

Table 3.19: *Comparison of Binary versus Three-level Classification by Crossing the Gambling Problem Severity Subscale (GPSS) and the Merged Gold Standard*

GPSS	Three gold standard merged			Total
	Green light CRAGS = 1 DSMs = 0	Yellow light At least one gold standard over 0, but no positive[a]	Red light At least one positive gold standard	
Two-level categorization				
0–5	44 (100%)	23 (88.5%)	4 (11.4%)	71 (67.6%)
6+	0	3 (11.5%)	31 (88.6%)	34 (32.4%)
Three-level categorization (Solution A)				
0	21 (47.7%)	5 (19.2%)	1 (2.9%)	50 (47.6%)
1–5	23 (52.3%)	18 (69.2%)	3 (8.6%)	21 (20%)
6+	0	3 (11.5%)	31 (88.6%)	34 (32.4%)
Three-level categorization (Solution B)				
0–1	38 (86.4%)	10 (38.5%)	2 (5.7%)	50 (47.6%)
2–5	6 (13.6%)	13 (50.0%)	2 (5.7%)	21 (20%)
6+	0	3 (11.5%)	31 (88.6%)	34 (32.4%)
Total	**44 (100%)**	**26 (100%)**	**35 (100%)**	**105**

3.5 Convergent Validity

Convergent validity was examined by computing correlation coefficients between the five CAGI scales and indicators of gambling involvement for the sample of students who had gambled in the past three months. As shown in Table 3.20, each indicator of gambling implication was correlated > .30 with at least one CAGI scale and ranged from *r* = .14 to .67. These findings suggest that high scores on the gambling measures corresponded with high scores on the five CAGI scales. The moderate strength of the measured correlations with gambling behaviours indicators and consequences provides evidence of the validity of the five CAGI scales.

Table 3.20: *Convergent Validity: Pearson Correlation Coefficients between Subscales and Gambling Involvement Measures*

Gambling involvement measures (n)	Psychological consequences	Social consequences	Financial consequences	Loss of control	Gambling problem severity
Number of games played (759)	**.40**	**.39**	**.41**	**.53**	**.52**
Highest level of gambling frequency (731)	**.39**	**.36**	**.40**	**.47**	**.47**
Sum of gambling frequency (731)	**.46**	**.48**	**.49**	**.55**	**.58**
Highest amount of time spent gambling[1] (630)	.23	**.34**	.14	**.31**	**.32**
Time spent gambling in a typical week (754)	**.50**	**.58**	**.60**	**.60**	**.67**
Sum of money lost on gambling (535)	**.32**	**.49**	**.50**	**.43**	**.51**
Highest amount of money lost in one day[1] (618)	.22	**.40**	.17	**.38**	**.39**
Current gambling debt[1] (669)	**.35**	**.52**	**.46**	.22	**.47**
How many friends gamble[1] (714)	.25	.21	.17	**.38**	**.35**

Note: Correlations >.30 are in bold. All correlations are significant at $p < .001$.

[1] These indicators have been calculated only with Phase II data.

Whereas Table 3.20 shows univariate analyses between the CAGI subscales and measures of gambling involvement, Table 3.21 shows the results of stepwise multiple regressions conducted to

assess the relationship between the five CAGI subscales and gambling behaviours measures. These results demonstrate that each CAGI subscale made a unique contribution in predicting the gambling indicators. For example, almost half (47%) of the variance in the 'sum of time spent on gambling in a typical week' measure was explained by four CAGI subscales and one-third of the variance in the 'sum of money spent gambling' measure was explained by four CAGI subscales. These results further demonstrate the validity of the CAGI subscales and also provide evidence of the unique contributions of each CAGI subscale in predicting gambling behaviour involvement and consequences.

Table 3.21: *Regression between CAGI Subscales and Gambling Involvement Measures*

Regression step	Related variables	β	R^2	ΔR^2
Number of games played (*n* = 759)				
1	Loss of control	.34	.28	.28
2	Gambling problem severity	.24	.30	.02
Highest level of gambling frequency (*n* = 731)				
1	Gambling problem severity	.27	.22	.22
2	Loss of control	.25	.24	.02
Sum of time spent on gambling in a typical week (*n* = 754)				
1	Gambling problem severity	.21	.45	.45
2	Loss of control	.21	.45	.01
3	Financial consequences	.19	.46	.01
4	Social consequences	.16	.47	.01
Sum of money spent gambling (*n* = 535)				
1	Psychological consequences	-.24	.10	.10
2	Social consequences	.35	.24	.14
3	Financial consequences	.33	.32	.08
4	Loss of control	.17	.33	.01

Next, Table 3.22 shows the comparison of the CAGI GPSS categories to the other four CAGI subscales and the gambling involvement measures. The question is: Are the three groups identified by the GPSS subcategories (no problem, low-to-moderate severity, high severity) different on levels of consequences as measured by the four other subscales of the CAGI and on many indicators of gambling involvement? Results demonstrate statistically significant differences between the CAGI GPSS categories on these measures. For example, the students in the high severity category had significantly higher scores on loss of control, financial consequences, social consequences and psychological consequences, as well as time spent on gambling, number of games played, and gambled more frequently and with larger amounts of money than students in the no problem and low-to-moderate severity categories.

Table 3.22: *Comparison of CAGI Gambling Problem Severity Subscale Categories with the Four CAGI Subscales and Other Correlates*

CAGI subscales and gambling involvement measures ***n***	**No problem** **Mean (*SD*)** ***n***	**Low-to-moderate severity** **Mean (*SD*)** ***n***	**High severity** **Mean (*SD*)** ***n***	**Total** **Mean (*SD*)**
Psychological consequences *n* = 759	0.36 (0.97) [a] *n* = 567	2.93 (2.98) [a] *n* = 130	7.76 (4.68) [a] *n* = 62	1.41 (2.91)***
Social consequences *n* = 759	0.02 (0.2) [a] *n* = 567	0.57 (1.13) [a] *n* = 130	4.5 (3.87) [a] *n* = 62	0.48 (1.71)***
Financial consequences *n* = 759	0.2 (0.53) [a] *n* = 567	1.13 (1.3) [a] *n* = 130	5.5 (4.63) [a] *n* = 62	0.79 (2.08)***
Loss of control *n* = 759	0.46 (0.84) [a] *n* = 567	2.5 (1.8) [a] *n* = 130	6 (2.93) [a] *n* = 62	1.26 (2.08)***
Time spent on gambling (min.) *n* = 754	69.53 (140.86) [a] *n* = 563	218.81 (308.64) [a] *n* = 129	719.39 (689.72) [a] *n* = 62	148.5 (319.19)***
Number of games played *n* = 759	2.92 (2.04) [a] *n* = 567	4.42 (2.55) [a] *n* = 130	7.13 (3.42) [a] *n* = 62	3.52 (2.57)***
Highest level of gambling frequency *n* = 731	1.86 (1.12) [a] *n* = 543	2.92 (1.3) [a] *n* = 127	3.77 (1.12) [a] *n* = 61	2.21 (1.3)***
Sum of gambling frequency *n* = 731	5.14 (5.25) [a] *n* = 543	9.48 (7.72) [a] *n* = 127	17.66 (10.4) [a] *n* = 61	6.94 (7.26)***
Sum of money spent gambling *n* = 535	19.06 (41.63) [a] *n* = 379	56.41 (98.34) [b] *n* = 102	708.3 (1389.2) [a b] *n* = 54	95.75 (486.84)***
Current gambling debt[1] *n* = 669	0.76 (6.25) [a] *n* = 523	2.58 (12.7) [b] *n* = 117	57.76 (173.6) [a b] *n* = 29	3.55 (38.15)***
Highest amount of time spent gambling[1] *n* = 630	52.91 (107.25)[ab] *n* = 492	129.74 (179)[a] *n* = 110	190.57 (264.81)[b] *n* = 28	72.44 (137.97)***
Highest amount of money lost in one day[1] *n* = 618	11.82 (49.67)[a] *n* = 484	32.07(57.07)[a] *n* = 108	139.77(233.03)[a] *n* = 484	20.74 (73.33)***
How many friends gamble[1] *n* = 714	0.61 (0.60)[ab] *n* =561	1.08 (0.73)[a] *n* = 123	1.33 (0.84)[b] *n* = 30	0.7 (0.67)***

Note: Means in a row sharing subscripts are significantly different from each other.

* $p < .05$. ** $p < .01$. *** $p < .001$.

[1] These indicators have been calculated only with Phase II data.

Table 3.23 shows correlation coefficients between the five CAGI subscales and measures of constructs thought to be related to problem gambling among youth (See Phase II report for a discussion of the conceptual framework). Evidence of a significant relationship is present if the magnitude of the correlation is > .30. The results reveal a mixed picture in that some scales thought to be related to problem gambling were in fact related, while others were not. Specifically, measures of impulsivity, risk taking and self-control were correlated with one or more CAGI subscales, while cognitive distortions, decision making and self-efficacy were all below the threshold of r > .30. The two strongest correlates of problem gambling were measures of risk taking and self-control, in that all five CAGI subscales yielded correlation coefficients greater .30. This suggests that further research should examine the nature of the relationship between general risk taking, impaired or poor self-control and impulsivity and adolescent problem gambling. It further suggests that cognitive distortions, decision making and self-efficacy may be of less importance to adolescent problem gambling.

Table 3.23: *Convergent Validity: Pearson Correlation Coefficients between CAGI Subscales and Correlates*

Correlates	Psychological consequences	Social consequences	Financial consequences	Loss of control	Gambling problem severity
Cognitive distortions[1] *n* = 716	.12**	.08*	.16***	.10**	.14***
Impulsivity *n* = 754	.30***	.24***	**.30*** **	.28***	**.31*** **
Risk taking *n* = 754	**.37*** **	**.36*** **	**.40*** **	**.42*** **	**.45*** **
Decision making *n* = 751	-.21***	-.19***	-.27***	-.18***	-.25***
Self-efficacy *n* = 753	-.08*	-.08*	-.12**	-.07	-.09*
Self-control *n* = 577	**-.36*** **	**-.35*** **	**-.40*** **	**-.38*** **	**-.43*** **

Note: Correlations >.30 are in bold. * $p < .05$. ** $p < .01$. *** $p < .001$.

[1] This indicator has been calculated only with Phase II data.

A closer examination of the comparison between CAGI GPSS categories and constructs thought to be related to adolescent problem gambling is provided in Table 3.24. While the previous table showed correlation coefficients, Table 3.24 shows ANOVAs for the CAGI Gambling Problem Severity Scale categories. Again, the results are mixed. Whereas impulsivity, risk taking and decision making show statistically significant differences between categories, cognitive distortions, self-efficacy and self-control do not. These results are similar to the results in the previous table in that general risk taking and impulsivity are significantly different while cognitive distortions and self-efficacy are not. In contrast to the previous table, self-control was not significantly different, but decision making was. Some of

these discrepancies may be due to the small number of students in the high severity category. Nevertheless, these results suggest that additional research attention should be focused on the nature of the relationship between impulsivity, risk taking, self-control and adolescent problem gambling.

Table 3.24: *Comparison of Gambling Status Categories and Validated Scales*

Validated Scales ***n***	**No problem** **Mean (*SD*)** ***n***	**Low-to-moderate severity** **Mean (*SD*)** ***n***	**High severity** **Mean (*SD*)** ***n***	**Total** **Mean *(SD)***
Cognitive distortions[1] *n* = 716	1.27 (1.13) [ab] *n* = 566	1.6 (1.2) [b] *n* = 121	1.72 (1.3) [a] *n* = 29	1.34 (1.16)
Impulsivity *n* = 754	1.89 (1.65) [a] *n* = 566	2.5 (1.8) [a] *n* = 127	3.75 (1.5) [a] *n* = 61	2.14 (1.75)***
Risk-taking *n* = 754	2.5 (1.58) [a] *n* = 566	3.35 (1.6) [a] *n* = 127	5.44 (1.7) [a] *n* = 61	2.88 (1.8)***
Decision-making *n* = 751	6.8 (2.9) [a] *n* = 563	5.75 (3.38) [a] *n* = 127	3.85 (3.25) [a] *n* = 61	6.35 (3.14)***
Self-efficacy *n* = 753	16.24 (2.46) *n* = 565	15.6 (3.43) *n* = 127	15.44 (3.63) *n* = 61	16.07 (2.77) [§]
Self-control *n* =577	44.65 (7.5) [a] *n* = 577	41.01 (8.7) [a] *n* = 75	31.56 (8.62) [a] *n* = 43	43.2 (8.53)

Note: Means in a row sharing subscripts are significantly different from each other.
[§] p < .10. * *p* < .05. ** *p* < .01. *** *p* < .001.

[1] This indicator have been calculated only with Phase II data.

3.6 Limitations

In spite of our best efforts, our sample for Phase III was smaller than we had hoped. It is important to remember that Phase III participants represent a unique sample of individuals, primarily francophone, from a number of substance abuse and detention treatment centres in Québec. Therefore, both the small number of participants and the recruitment sites used would indicate that our sample is likely not representative of the larger population of Canadian adolescents with gambling problems.

There is no gold standard for the identification of adolescents with gambling problems. The two most commonly used measures of youth gambling, the SOGS-RA and DSM-IV-MR-J, have questionable reliability, validity and classification accuracy (Stinchfield, 2010). Therefore, this phase of the study employed three standards: two based on DSM-IV and a third based on a clinician rating scale developed specifically for this study. There is little evidence that DSM-IV based measures are valid for youth and therefore reliance on DSM-IV is a limitation, but it was the best standard available given that it has been shown to be valid for adults. The use of the clinician rating scale is limited in that its psychometric

properties are unknown. However, clinician-rating scales have been used in this type of research before and have been shown to be useful.

The CAGI, like most instruments, relies on self-report and there is no objective verification of participants' responses. Methods were employed to facilitate the validity of self-report, including assuring the participant of confidentiality and anonymity, using a private and quiet room in which to administer the CAGI, and the use of a fake gambling activity, 'blotzito', to identify participants who may not be paying attention or who are exaggerating their gambling. Validity of self-reports can be influenced by administration demand characteristics such as whether the test results will have an impact on the test taker, whether the results will be shared with others (i.e., parents), or whether the results will be used to determine if further testing or referral to social/educational services is required. Additional research needs to be conducted on the validity of self-report and particularly on the conditions that yield accurate self-report.

4 The CAGI

The final version of the CAGI is composed first of a section where a behavioural component of gambling is evaluated through participation in 19 potential types of gambling or betting activities conducted during the last three months. For each activity, the respondent has to indicate the frequency on a six-point scale (not in the past three months = 0; daily = 5) and the time spent in a typical week on this activity (hours and minutes). Gambling or betting is defined as an activity "when you bet or risk money or something of value to have a chance to win or gain money or something else of value". A synthesis question concerning the total amount of money the participant lost on all gambling/betting activities done during the last three months is then asked, followed by a complementary question concerning the value of objects lost on gambling/betting during the same period. No scoring is done on this part of the CAGI.

Next, 24 items concerning consequences of gambling/betting in different areas of life are presented. All items have a four-response option concerning a rough estimate of frequency (never; sometimes; most of the times; almost always) or another, more precise estimate of frequency (never; 1–3 times; 4–6 times; 7 or more times). The 24 consequences items are composed of five subscales. Three refer to consequences experienced by adolescents: psychological, social and financial. A fourth subscale concerns the loss of control over gambling behaviours, while the fifth subscale concerns the global severity of gambling problems.

4.1 Response Options

- Gender: Male / female
- Age: (Record age)
- Question 1a – 19a: Not in the past three months; about once per month; 2–3 times per month; about once per week; 2–6 times per week; daily
- Question 1b – 19b: (Record hours and minutes)
- Questions 20a-20b: (Record actual dollar amount)
- Questions 21 – 40: Never = 0; sometimes = 1; most of the time = 2; almost always = 3
- Questions 41 – 44: Never = 0; 1–3 times = 1; 4–6 times = 2; 7 or more times = 3

4.2 Scoring

For each domain, add item according to response scales above.

Psychological consequences (six items)

- Add items 21, 23, 25, 28, 31, 34. Scores range from 0–18.

Social consequences (five items)

- Add items 22, 24, 26, 29, 32. Scores range from 0–15.

Financial consequences (six items)

- Add items 38, 39, 41, 42, 43, 44. Scores range from 0–18.

Preoccupation and impaired control (four items)

- Add items 27, 30, 33, 36. Scores range from 0–12.

4.3 Interpretation

The first subscale to interpret is the Gambling Problem Severity Subscale (GPSS) score, which gives, as the name indicates, a degree of global severity of gambling problems. Items composing the GPSS are spread among the four subconcepts of gambling problems (i.e., psychological, social, financial consequences and loss of control) as seen in Table 4.1

Table 4.1: *GPSS's Item Distribution through the Four Concepts Composing the CAGI*

Four concepts composing the CAGI	Items
Psychological consequences	28. How often have you felt bad about the way you gamble/bet or what happens when you gamble/bet?
	40. In the past three months, how often have you felt that you might have a problem with gambling/betting?*
Social consequences	22. How often have you skipped practice or dropped out activities (such as team sports or band) due to your gambling /betting?
	26. How often have you skipped hanging out with friends who do not gamble/bet to hang out with friends who do gamble/bet?
	37. How often have you hidden your gambling/betting from your parents, other family members or teachers?*
Financial consequences	42. How often have you taken money that you were supposed to spend on lunch, clothing, movies, etc., and used it to gamble/bet or to pay off your gambling/betting debts?
	44. How often have you stolen money or others things of value in order to gamble/bet or pay off your gambling/betting debts?
Loss of control	27. How often have you planned your gambling/betting activities?
	35. How often have you gone back another day to try to win back the money you lost while gambling/betting?*

* Items not used in the calculation of the other four subscales scores.

The distribution of GPSS scores are interpreted as follows:

- 0–1 No problem (green light)
- 2–5 Low-to-moderate severity (yellow light)
- 6+ High severity (red light)

The four other subscales must be interpreted through percentiles. In Table 4.2, the shaded area indicates the threshold for a significant distance over the mean (i.e. two standard deviations). This statistical criterion is often used as an indicator of a marginal behaviour or characteristic compared to the overall group. The same table is used for both genders and ages groups (including 18-year-olds). Comparison of subscales mean by gender and age did not show significant differences except for the loss of control subscale. (This is why percentiles are presented by gender for this subscale.) Results of MANOVA and ANOVA are presented in the Appendix. Percentiles are calculated among a sample of gamblers (last three months) from Manitoba and Québec high schools.

Table 4.2: *Percentiles Classification among Four Subscales (N = 864)*

Percentiles	Psychological consequences subscale score	Social consequences subscale score	Financial consequences subscale score	Loss of control subscale score		Percentiles
				Female	Male	
100	14–18	8–15	6–18	7–12	10–12	**100**
99	9–13	6–7	5	5–6	9	**99**
98	8	4–5	4	4	7–8	**98**
97	6–7	3	3	4	6	**97**
96	5	3	3	3	5	**96**
95	5	2	2	3	5	**95**
94	4	1	2	3	4	**94**
93	4	1	2	3	4	**93**
92	4	1	2	2	4	**92**
91	3	0	1	2	4	**91**
90	3	0	1	2	4	**90**
85	2	0	1	2	3	**85**
80	1	0	1	1	2	**80**
75	0	0	0	1	2	**75**
70	0	0	0	0	1	**70**
65	0	0	0	0	1	**65**
60	0	0	0	0	1	**60**
0–55	0	0	0	0	0	**0–55**
Means	1.05	.29	.47	0.66	1.30	**Means**
SD	2.37	1.33	1.17	1.21	1.94	**SD**
2SD	4.74	2.66	2.34	2.42	2.88	**2SD**

CAGI

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Canadian Adolescent Gambling Inventory, V 1.09, July 2010

Canadian Centre on Substance Abuse and the Interprovincial Consortium on Gambling Research

Tremblay, J., Wiebe, J., Stinchfield, R., Wynne, H.

File ID

Date ____ - ____ - ____ (Year - Month - Day)

Age ____ years old Gender : ○ Male ○ Female

What grade are you in?

○ Grade 7 ○ Grade 10
○ Grade 8 ○ Grade 11
○ Grade 9 ○ Grade 12

First name:_____ (optional) Last name:_____ (optional)

The following questionnaire is about gambling. By gambling, we mean when you **bet or risk money or something of value** so that you can win or gain money or something else of value.

1. IN THE LAST 3 MONTHS... How often did you bet or gamble money or something of value in the following activities and approximately how much time per week did you spent on each one?	**1a) In the last 3 months, how often have you gambled or bet on this activity? If you answer "Not in the past 3 months" go to the next activity.**						**1b) In the last 3 months, about how much time did you spend on this activity in a typical week (hours:minutes)?**
	Not in the past 3 months	About once/ month	2-3 times/ month	About once/ week	2-6 times/ week	Daily	Hours / Minutes
1. Internet (for money)..... ○ Poker ○ Slot machine ○ Others _____	1a) ○	○	○	○	○	○	1b) __ : __
The following activities do not include internet							
2. Lottery tickets (e.g.. 6/49, Super 7)..	2a) ○	○	○	○	○	○	2b) __ : __
3. Instant-win or scratch tickets (e.g. break-open, pull-tab, Nevada strips).....	3a) ○	○	○	○	○	○	3b) __ : __
4. Raffle or fundraising tickets.....	4a) ○	○	○	○	○	○	4b) __ : __
5. Blotzito	5a) ○	○	○	○	○	○	5b) __ : __
6. Cards for money (poker, black jack, etc.).....	6a) ○	○	○	○	○	○	6b) __ : __
7. Board or dice (for money).....	7a) ○	○	○	○	○	○	7b) __ : __
8. Video lottery terminals.....	8a) ○	○	○	○	○	○	8b) __ : __
9. Slot machines at casinos or racetracks.....	9a) ○	○	○	○	○	○	9b) __ : __
10. Arcade or video games for money or something of value.....	10a) ○	○	○	○	○	○	10b) __ : __
11. Sport Select (e.g. Pro Line, Over/Under, Point Spread).....	11a) ○	○	○	○	○	○	11b) __ : __
12. Sports pools or games (hockey, basketball, etc.)....	12a) ○	○	○	○	○	○	12b) __ : __
13. Sports through a bookie (i.e. someone who accepts and pays off bets).....	13a) ○	○	○	○	○	○	13b) __ : __
14. Horse race (i.e. live at track and/or off-track).....	14a) ○	○	○	○	○	○	14b) __ : __
15. Table games at casinos (e.g. poker, black jack, roulette).....	15a) ○	○	○	○	○	○	15b) __ : __
16. Your or someone else's performance in games of skill (e.g. pool, golf, bowling, darts) or other activities (e.g. sports school).....	16a) ○	○	○	○	○	○	16b) __ : __
17. A dare or challenge that you or someone else can do something.....	17a) ○	○	○	○	○	○	17b) __ : __
18. Bingo (for money or something of value).....	18a) ○	○	○	○	○	○	18b) __ : __
19. Any other form of gambling/betting (What is it? Please write down)..... _____	19a) ○	○	○	○	○	○	19b) __ : __

CAGI

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If you have not gambled on any of the above activities DURING THE LAST THREE MONTH, the questionnaire is done. If you gambled on one or more activities, please continue to item #20a.

20a. DURING THE LAST 3 MONTHS, how much money in total did you lose on gambling/betting? If you did not lose any money, enter "0" (in dollars). $☐☐☐☐,00

20b. DURING THE LAST 3 MONTHS, did you lose something of value on gambling/betting? If yes, write down its value (in dollars) and what was it (if more than one, calculate the total value): $☐☐☐☐,00

☐

The following questions are about your gambling/betting OVER THE PAST 3 MONTHS.

	Never	Some -times	Most of the time	Almost Always		Reserved for administration purpose: PCS	SCS	FCS	LCS	GPSS
21. How often have you felt guilty about how much money you have lost gambling/betting?.....	0	1	2	3	21.	☐				
22. How often have you skipped practice or dropped out of activities (such as team sports or band) due to your gambling/betting?.....	0	1	2	3	22.		☐			☐
23. How often have you felt sad or depressed about how much money you have lost gambling/betting?.....	0	1	2	3	23.	☐				
24. How often have you skipped family gatherings in order to gamble/bet?.....	0	1	2	3	24.		☐			
25. How often has gambling/betting made you feel frustrated?.....	0	1	2	3	25.	☐				
26. How often have you skipped hanging out with friends who do not gamble/bet to hang out with friends who do gamble/bet?.....	0	1	2	3	26.		☐			☐
27. How often have you planned your gambling/betting activities?.....	0	1	2	3	27.				☐	☐
28. How often have you felt bad about the way you gamble/bet or what happens whenyou gamble/bet?.....	0	1	2	3	28.	☐				☐
29. How often have you skipped get-togethers with friends in order to gamble/bet?.....	0	1	2	3	29.		☐			
30. How often have you gambled/bet your winnings?	0	1	2	3	30.				☐	
31. How often has gambling/betting made you feel stressed?.....	0	1	2	3	31.	☐				
32. How often have your family or friends complained that you gamble/bet too much?	0	1	2	3	32.		☐			

CAGI

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The following questions are about your gambling/betting OVER THE PAST 3 MONTHS.

	Never	Some-times	Most of the times	Almost Always	
33. How often have you gambled/bet for longer periods of time than you intended to?	0	1	2	3	33.
34. How often have you felt it would be better for your well-being to stop gambling/betting?	0	1	2	3	34.
35. How often have you gone back another day to try to win back the money you lost while gambling/betting?	0	1	2	3	35.
36. How often have you gambled/bet with more money than you intended to?	0	1	2	3	36.
37. How often have you hidden your gambling/betting from your parents, other family members or teachers?	0	1	2	3	37.
38. How often have you had difficulties paying your gambling/betting debts?	0	1	2	3	38.
39. How often has someone put pressure on you, in any way, to pay what you owe after you lost a gamble/bet?	0	1	2	3	39.
40. In the past 3 months, how often have you felt that you might have a problem with gambling/betting?	0	1	2	3	40.

Sometimes people do things because of gambling/betting. Please tell us how often you have done the following things in THE PAST 3 MONTHS

	Never	1- 3 times	4 - 6 times	7 or more times	
41. How often have you borrowed money from family, friends, or others to gamble/bet?	0	1	2	3	41.
42. How often have you taken money that you were supposed to spend on lunch, clothing, movies, etc., and used it for gambling/betting or for paying off gambling/betting debts?	0	1	2	3	42.
43. How often have you sold your personal property (such as electronics, clothings, etc) to have money to gamble/bet or to pay off your gambling/betting debts?	0	1	2	3	43.
44. How often have you stolen money or other things of value in order to gamble/bet or to pay off your gambling/betting debts?	0	1	2	3	44.

Total scores:

Reserved for administration purpose				
PCS	SCS	FCS	LCS	GPSS

5 Further Research

The research in this report reflects initial estimates of reliability, validity and classification accuracy. Future research is required to confirm the factorial structure of the CAGI. This development study provides preliminary cutscores and interpretations of scale scores. Future research is needed to cross-validate these preliminary cutscores used to classify adolescents into categories. This research should be conducted with populations more likely to have adolescents with gambling problems (e.g., targeting youth who are known gamblers and targeting locations where they participate in gambling activities). Possible client recruitment sites could include alternative schools and juvenile detention centres that have higher rates of gambling and problem gambling. There is also a need for future research to explore the development of norms for sex and age. This study reported differences by sex and age in relation to the CAGI items. However, due to relatively small and non-representative sample, it was premature to propose sex- or age-specific status categories.

More rigorous research is needed on the psychometric properties of the CAGI and, most importantly, more research is needed on classification accuracy. This research should include populations and settings where the CAGI will most likely be administered, such as schools, school counselling centres, adolescent alcohol and drug abuse treatment centres and juvenile detention settings, to name a few. The classification accuracy of the CAGI is affected by the base rate of the disorder within the setting where it is administered; therefore, the classification accuracy results obtained in the development may be different from results obtained when administered in a different setting (Gambino, 2005). Research on the validity of the CAGI should not end here. Research on the validity of the CAGI should be considered an ongoing dynamic process of accumulating evidence from different populations and settings.

More descriptive research needs to be done on the phenomenon of youth gambling and problem gambling in order to have a better understanding of adolescent problem gambling. This understanding can then be translated into items and scales that contain the relevant domains—the very definition of content validity. For example, one of the goals of the development of the CAGI was to measure the continuum of youth problem gambling; however, this goal was likely only partially achieved. It was addressed by developing items that were thought to reflect low and moderate gambling problem severity, which are lacking in most instruments of problem gambling. Yet, there are likely other items that would measure this segment of the continuum. Future research should address the development and testing of these items.

Finally, future research must use scientific standards recommended for testing set forth by the American Educational Research Association, the American Psychological Association and the National Council on Measurement in Education (AERA-APA-NCME, 1999). These guidelines describe technical standards for test use and evaluation, including minimum criteria for psychometric properties. Psychometric research on the CAGI will lead to refinement and greater precision, which is the mark of good science.

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Appendix A: Complementary CFA Tables

Table A1: *CFA: Factor Loadings of the Four-Factor Model*

Parameter	Unstandardized	Lower CI	Upper CI	Standardized
Psy → q35_q	1.000	–	–	.833
Psy → q35_r	.992	.927	1.061	.852
Psy → q35_s	.908	.810	1.010	.603
Psy → q35_o	1.133	1.051	1.220	.817
Psy → q35_n	.884	.815	.958	.767
Psy → q35_p	1.023	.946	1.105	.789
Soc → q35_aa	1.000	–	–	.811
Soc → q35_dd	1.061	.981	1.147	.795
Soc → q35_z	1.409	1.315	1.511	.881
Soc → q35_bb	1.308	1.217	1.408	.849
Soc → q35_v	1.010	.912	1.113	.667
Fin → q34_c	1.000	–	–	.737
Fin → q34_a	1.410	1.250	1.584	.623
Fin → q34_b	1.370	1.217	1.536	.635
Fin → Q37_CRR	.844	.758	.939	.715
Fin → q34_d	1.494	1.370	1.633	.821
Fin → Q37_DRR	.886	.793	.989	.699
LC → q35_c	1.000	–	–	.637
LC → Q35_LRR	1.249	1.110	1.410	.711
LC → q35_h	1.186	1.071	1.322	.846
LC → q35_f	1.114	1.000	1.249	.805

Table A2: *CFA: Measurement Error Variances of the Four-factor Model*

Parameter	Unstandardized	Lower CI	Upper CI	Standardized
e1	.095	.084	.108	.306
e2	.080	.070	.091	.273
e3	.311	.280	.346	.636
e4	.138	.122	.156	.333
e5	.118	.105	.132	.411
e6	.136	.121	.153	.377
e7	.041	.036	.046	.342
e8	.052	.046	.059	.368
e9	.045	.039	.052	.223
e10	.053	.046	.060	.279
e11	.100	.090	.112	.555
e12	.062	.055	.070	.457
e13	.230	.207	.257	.612
e14	.203	.182	.227	.597
e15	.050	.044	.056	.488
e16	.079	.069	.091	.326
e17	.060	.054	.068	.511
e18	.254	.228	.284	.594
e19	.263	.234	.296	.494
e20	.097	.083	.112	.285
e21	.116	.102	.133	.351

Table A3: CFA: Factor Variances and Covariance of the Four-factor Model

Parameter	Unstandardized	Lower CI	Upper CI	Standardized
Psy	.215	.187	.248	1.000
Soc	.079	.068	.092	1.000
Fin	.073	.061	.087	1.000
LC	.173	.139	.212	1.000
Psy ↔ Soc	.098	.085	.113	.753
Psy ↔ Fin	.091	.078	.106	.722
Psy ↔ LC	.149	.127	.174	.772
Soc ↔ Fin	.057	.049	.066	.744
Soc ↔ LC	.082	.069	.097	.701
Fin ↔ LC	.090	.076	.106	.799

Appendix B: Questionnaires Related to Other Concepts than Gambling and Administered at the Beginning of the Clinical Interview

General Informations

(questions ask by the interviewer)

Research ID

1. Are you male or female?

- O Male
- O Female

2. How old are you?

☐☐ **years old**

3. What grade are you in?

- O Grade 7
- O Grade 8
- O Senior 1
- O Senior 2
- O Senior 3
- O Senior 4

4. How would you describe yourself?

- O White
- O Black/African
- O Asian
  comme la Chine, le Japon, le Vietnam, etc.)
- O Aboriginal/First Nations
  (par ex. communautés Cri, Mohawk, Wendake, etc.)
- O Mexican/Hispanic/Latin
  parlant espagnol ou portugais, etc.)
- O I don't know
- O Other, please write in ☐

5. During the past month, how much money did you get from your job, allowance, and all other sources?

- O I didn't get any money
- O <$10
- O $11 - $20
- O $21 - $50
- O $51 - $100
- O $101 - $200
- O >$201

6. How do you perceive your family's economic situation?

- O I think my family's a well-off financially.
- O I think my family's income is sufficient to fulfill our basic needs.
- O I think my family is poor.
- O I think my family is very poor.

7. Have you been staying in a secured institution setting for more than three months within the past three month period?

O Yes O No

Beginning date:

☐☐☐☐ - ☐☐ - ☐☐

Year **Month** **Day**

Ending date:

☐☐☐☐ - ☐☐ - ☐☐

Year **Month** **Day**

The following questions concern the last three months. IF YOU HAVE BEEN STAYING IN A SECURED INSTITUTION SETTING FOR LESS THAN THREE MONTHS WITHIN THIS PAST THREE MONTH PERIOD, you must answer the following questions by thinking of the three months prior to your entry in the secured institution setting and not the last three months. For example, if you were in a secured institution setting within the past two months, you must answer by thinking of the three months before the two months you've been in the Center.

You can give some informations to the participant about the next questionnaires

9474016012

CAGI's Supplement

Research ID

The following survey is about gambling. By gambling we mean when you bet or risk money or something of value so that you can win or gain money or something else of value. This survey isn't about gambling without money or without somethnig else of value.

Thanks to complete this survey.

The following questions concern the last three months. **If you have been staying in a secured institution setting for less than three months within this past three month period** you must answer the following questions by thinking of the three months prior to your entry in the secured institution setting and not the last three months. For example, if you were in a secured institution setting within the past two months, you must answer by thinking of the three months before the two months you've been in the Center.

1. How old were you when you first gambled/bet money or something of value?

☐☐ years old ○ I have never gambled/bet

2. When you first started gambling/betting, did you win large amounts of money or something of value?

○ Yes ○ No ○ I have never gambled/bet

3. How much money did you win the first time you gambled/bet?

○ I don't remember	○ $11 - $20	○ $101 - $200
○ I didn't win any money	○ $21 - $50	○ More than $201
○ < $10	○ $51 - $100	○ I have never gambled/bet

4. Please tell us "yes" or "no" to the following questions

A. Do you generally do and say things without stopping to think?	○ Yes	○ No
B. Do you usually think carefully before doing anything?	○ Yes	○ No
C. Do you mostly speak before thinking things out?	○ Yes	○ No
D. Do you often get into trouble because you do things without thinking?	○ Yes	○ No
E. Are you an impulsive person (i.e. a person who uncontrollably reacts or does things immediately without any thought to the action or its consequences)?	○ Yes	○ No

5. Please tell us if you have done the following activities IN THE PAST 3 MONTHS

A. Drank alcohol (even one drink)	○ Yes	○ No
B. Smoked a cigarette (even a puff)	○ Yes	○ No
C. Use any illegal drug	○ Yes	○ No
D. Been in a physical fight	○ Yes	○ No
E. Rode a bicycle or motorcycle without a helmet (even once)	○ Yes	○ No
F. Rode in a car without wearing a seatbelt (even once)	○ Yes	○ No
G. Stolen anything from a store	○ Yes	○ No

6. The next set of questions are about how you handled problems you had IN THE PAST MONTH.

Question	Never	Sometimes	Most of the times	Almost always
A. How often did you think about what you could do before you did something about the problem?	○	○	○	○
B. How often did you think about what would happen before you decided what to do about the problem?	○	○	○	○
C. How often did you think about which ways were the best to handle the problem?	○	○	○	○
D. How often did you think about what you needed to know so you could solve the problem?	○	○	○	○

7. Please tell us whether you agree or disagree with the following.

Statement	Strongly disagree	Disagree	I don't agree or disagree	Agree	Strongly agree
A. I can usually achieve what I want if I work hard for it.	○	○	○	○	○
B. Once I make plans, I am almost certain to make them work.	○	○	○	○	○
C. I can learn almost anything if I set my mind to it.	○	○	○	○	○
D. My major accomplishments are entirely due to my hard work and ability.	○	○	○	○	○

8. Please indicate how much each of the following statements reflects how you typically are.

Statement	Not at All	Sometimes	About half of the time	Much of the time	Very Much
A. I am good at resisting temptation	○	○	○	○	○
B. I have a hard time breaking bad habits	○	○	○	○	○
C. I am lazy	○	○	○	○	○
D. I say inappropriate things	○	○	○	○	○
E. I do certain things that are bad for me	○	○	○	○	○
F. I refuse things that are bad for me	○	○	○	○	○
G. I wish I had more slef-discipline	○	○	○	○	○
H. People would say that I have iron self-discipline	○	○	○	○	○
I. Pleasure and fun sometimes keep me from getting work done	○	○	○	○	○
J. I have trouble concentrating	○	○	○	○	○
K. I am able to work effectively towards long-term goals	○	○	○	○	○
L. Sometimes, I can't stop myself from doing something, even if I know it is wrong	○	○	○	○	○
M. I often act without thinking through all the alternatives	○	○	○	○	○

Appendix C: Clinical Interview

Goal of the Interview

The goal of the clinical interview is to evaluate the impact that gambling and betting has on the participant and, in particular, to assess how difficulties related to excessive gambling are experienced.

Instructions

During the interview, please ask participants each question precisely as it is written in this protocol, in the specific order presented. If participants don't understand a particular question, you may change its wording on second reading if necessary, but please ensure that every topic within the question is covered. When asking your own questions, please be sure to write them down in their entirety in the space provided so that we have them clearly on record.

Clinical Interview

1. **DURING THE PAST THREE MONTHS (or the three months priors to your entry in the secured institution setting), what kind of things have you bet on? How often? With what do you usually gamble or bet (money or things)? How much do you usually spend? With whom do you usually gamble? Where do you usually gamble?**

    a) Lottery:

    Yes / No

    How often:

    With what (money or things):

    How much:

    With whom:

    Where:

    b) Sporting Events:

    Yes / No

    How often:

    With what (money or things):

    How much:

With whom:

Where:

c) Sport Select:

Yes / No

How often:

With what (money or things):

How much:

With whom:

Where:

Where did you get the tickets from (probe for whether the respondent purchased the tickets)

d) Bingo:

Yes / No

How often:

With what (money or things):

How much $:

With whom:

Where:

e) Games of skills (e.g., pool, golf, bowling, video games, cards, etc.):

Yes / No

How often:

With what (money or things):

How much:

With whom:

Where:

f) Casino slot machines:

Yes / No

How often:

With what (money or things):

How much:

With whom:

Where:

g) Casino table games:

Yes / No

How often:

With what (money or things):

How much $:

With whom:

Where:

h) VLTs:

Yes / No

How often:

With what (money or things):

How much $:

With whom:

Where:

i) Internet (if the participant does not bet money for real, the interviewer must still ask him or her about their betting habits and write down that he or she does not bet money)**:**

Yes / No

How often:

With what (money or things):

How much $:

With whom:

Where:

j) Other (please specify):

Yes / No

How often:

With what (money or things):

How much $:

With whom:

Where:

2. a) DURING THE PAST THREE MONTHS (or the three months priors to your entry in the secured institution setting), when you talk about your gambling and betting with your parents, friends, or brothers and sisters, what do you usually tell them? (*Probe for telling lies and hiding signs of gambling.*) (GO TO Q.2c if the respondent never talks about gambling.)

Parents: (*If lies or hides, ask: "Why do you tell them this?*")

Friends: (*If lies or hides, ask: "Why do you tell them this?"*)

Siblings: (*If lies or hides, ask: "Why do you tell them this?"*)

2. b) What do they think of your gambling/betting? (*Probe for disapproval/approval, fights or arguments over gambling.*) After this question, GO TO Q.3.0a.

Parents:

Friends:

Siblings:

2. c) Why don't you talk about your gambling/betting? (*Probe for past disapproval, fights or arguments over gambling, telling lies and hiding signs of gambling.*)

Parents:

Friends:

Siblings:

3.0. a) In your family, who gambles/bets money?

3.0. b) To what degree would you say these people gamble? (Bring up the definition for gambling habits: lottery tickets, etc.)

Father:	Not at all	Very little	A little	Somewhat	Fairly	Very much
Mother:	Not at all	Very little	A little	Somewhat	Fairly	Very much
Brother 1:	Not at all	Very little	A little	Somewhat	Fairly	Very much
Brother 2:	Not at all	Very little	A little	Somewhat	Fairly	Very much
Sister 1:	Not at all	Very little	A little	Somewhat	Fairly	Very much
Sister 2:	Not at all	Very little	A little	Somewhat	Fairly	Very much
Other 1 : _____	Not at all	Very little	A little	Somewhat	Fairly	Very much
Other 2 : _____	Not at all	Very little	A little	Somewhat	Fairly	Very much

3.0. c) What do your parents think of gambling?

3.0. d) Does someone have gambling problems in your family?

3.1. a) What do YOU think of your gambling/betting?

Why do you think that way? (e.g., avoids certain types of gambling, cuts back on gambling, stops gambling altogether, increase gambling)

3.1. b) Do you think things would be better if you changed your gambling/betting in any way?

Yes / No

How?

3.1. c) DURING THE PAST THREE MONTHS (or the three months priors to your entry in the secured institution setting), have you tried to stop gambling? How many times? What was the result? (If "Never Tried": Do you think you could stop gambling whenever you wanted to?)

Tried to stop: Yes / No

How many times:

Result:

Could stop if wanted: Yes / No

3.1. d) Can you tell me about the last time you gambled/bet for money or for something of value?

How did you decide to gamble/bet (context, people around you, your thoughts, your emotions)?

How did the gambling/betting session go (context, people around you, your thoughts, your emotions)?

3.1 e) Can you tell me about a time when you had the opportunity to go gambling/betting but decided not to go?

How did you make the decision not to gamble/bet (context, people around you, your thoughts, your emotions)?

4. a) Have there ever been times in your life when you gambled more than you did in the last three months?

Yes / No

If "Yes": Ask for a detailed description of these periods including duration, amount of money lost, favourite activities participated in, who the participant was gambling with, what else was happening in his/her life at the time, etc.

4. b) Think of the first time you played for money or for something of value. Describe the context and what happened (e.g., money won, with whom, what game, atmosphere, etc.).

4. c) What attracted you to gambling/betting the first time and how did you feel when you gambled/bet?

4. d) Between (tell the age when he/she started gambling) and now, please describe your gambling experiences (e.g., new games, change in frequency, change in the betted amounts, increase, decrease or stability, etc.).

4. e) IF THE GAMBLING HABIT HAVE CHANGED OVER TIME, PLEASE ASK: Your gambling habits have changed over time, how do you explained this?

4. f) What attracted you to gambling, what do you enjoy and what makes you want to keep on gambling/betting ?

5. a) In the PAST THREE MONTHS, (or the three months priors to your entry in the secured institution setting), where have you gotten the money or other things you gamble/bet? (e.g., allowance, lunch money, money won, gifts, work, etc.)

5. b) What do you do when you want to gamble or bet and you don't have any money? (If the respondent isn't sure how to answer the question, provide examples such as: doesn't gamble, sells things, borrows, tries to find a way to have money, bets on credit, etc.) *Probe for stealing or taking money/things from others.*

5. b) NOTE TO THE INTERVIEWER: Keep in mind how much money the youth claims he or she receives each month by combining all of his or her sources of revenue. Please raise respectfully and naively any incoherence if the youth says he or she spends much more then what he or she earns (e.g. You have spent $x gambling during the course of a month and you have earned $x throught your different sources of revenue, is that correct?)

6. **Are the money or things you win when you gamble/bet important to you? What do you do with the money or the things that you win?** (e.g., buys things, tries winning more, pays debts, sells the things for money, gives them away, etc.)

   Important? Yes / No

   What do you do with the money?

7. **What do you do when you lose money or things you have gambled or bet?** (e.g., tries to win it/them back, borrows more money, etc.)

8. **a) DURING THE PAST THREE MONTHS, (or the three months priors to your entry in the secured institution setting), have you gone into debt or owed money to people because of your gambling/betting?** (If "Yes": How much and how often did that happen? Did you pay the money you owed back? How?)

   Yes / No

   b) How much debt did you get into or how much money did you owe?

   c) How often did you get into dept or owe money?

   d) Did you deal with your debt or pay back the money you owed? Where did you get the money to do this?

9. **When you are not gambling/betting, do you sometimes think about it?**

   Yes / No

   How often?

10. **Do you believe that there is something you could do to increase your chances of winning?**

    Yes / No

    What do you think you could do?

11. Would you say that the amount of time and money you spend gambling/betting prevents you from doing or buying other things?

Yes / No

What does it prevent you from doing or buying?

12. a) People sometimes set a limit on the amount of money that they want to gamble/bet. IN THE PAST THREE MONTHS (or the three months priors to your entry in the secured institution setting), did you ever set that kind of limit? For example, did you ever tell yourself: "Today I'm not going to bet more than $20?"

Yes / No If «NO», GO TO Q.12d

12. b) When you set a limit DURING THE PAST THREE MONTHS (or the three months priors to your entry in the secured institution setting), did you ever exceed it?

Yes / No

How often? (e.g., once in a while, quite often, usually, more than half the time)

12. c) How does it make you feel when you spend more money than intend? *(Probe for whether it bothers the participant, whether he or she wishes they had more self-control, whether he or she feels guilty, etc.)* After this question, GO TO Q.13a.

12. d) What determines the amount of money that you will spend gambling/betting? (*Try to get at whether the amount of money spent is planned or spontaneous.*)

13. a) Instead of limiting the amount of money they will spend when gambling, some people prefer to set a *time* limit. IN THE PAST THREE MONTHS (or the three months priors to your entry in the secured institution setting), did you ever set any time limits for your gambling? For example, do you tell yourself that you are only going to gamble for an hour before doing something else?

Yes / No If "No": GO TO Q.13d

13. b) DURING THE PAST THREE MONTHS (or the three months priors to your entry in the secured institution setting), when you set a time limit, did you ever exceed that limit and gamble for longer?

Yes / No

How often? (e.g., once in a while, quite often, usually, more than half the time)

13. c) How does it make you feel when you spend more time gambling than you intend to? (*Probe for whether it bothers the respondent, whether he or she wishes they had better self-control, whether the respondent feels guilty, etc.*) After this question, GO TO Q.14a.

13. d) What determines whether you have spent enough time gambling? (*Try to find out whether the amount of time spent gambling is planned or spontaneous. Is it always like that?*)

14. a) Do you think that gambling is a concern in your life?

Yes / No If "No": GO TO Q.14d

14. b) Would you say that gambling is a problem for you?

Yes / No If "No": GO TO Q.14d

What makes you think that? (*Probe for the criteria used for defining problem gambling and consequences of gambling that are cited as indicating a problem.*)

14. c) Have you ever sought help for your gambling problem?

Yes / No

What have you done?

14. d) If you thought that gambling was taking up too much of your life or that it had become a problem for you, what would you do? (e.g., resolve the problem on your own, ask for help (from whom, what kind of help, what would you expect from that person. etc.)

14. e) How would your current gambling/betting have to change in order for you to say that you have a gambling problem?

15. a) DURING THE PAST THREE MONTHS (or the three months priors to your entry in the secured institution setting), to what extent would you say that your gambling/betting has harmed your relationship with your parents?

Not at all Very little A little Somewhat Fairly Very much

How? (e.g., don't see each other, never home, don't participate in family activities, fights/arguments, etc.)

15. b) DURING THE PAST THREE MONTHS (or the three months priors to your entry in the secured institution setting), to what extent would you say that your gambling habits have affected the communication between you with your parents?

Not at all Very little A little Somewhat Fairly Very much

How? (i.e., how was the communication before, etc?)

If not at all at Q15a and Q15b, please go to Q16.

15. c) And before you had gambling habits, how was the atmosphere at home?

16. DURING THE PAST THREE MONTHS (or the three months priors to your entry in the secured institution setting), to what extent would you say that your gambling/betting has interfered with your school performance or extra-curricular activities?

Not at all (GO TO Q.17) Very little A little Somewhat Fairly Very much

How? (e.g., gets in trouble for gambling on school property, lowered grades, misses or is late for classes, can't concentrate, tired at school, etc.)

17. a) DURING THE PAST THREE MONTHS (or the three months priors to your entry in the secured institution setting), did you ever have a job?

To what extent would you say that your gambling habits have interfered with your job?

Not at all Very little A little Somewhat Fairly Very much

How? (e.g., missed or late for work, leaving earlier, being unable to concentrate, getting into trouble for gambling at work, tired at work, etc.)

17. b) Can you give me a brief summary of all the past helping relationships that you have ever had? (e.g., DPJ, foster family, placements, social worker, psychologist, nurse, youth leader at school or elsewhere). Please be concise (age, received services, institutions, etc.)**.**

17. c) What do you remember most of this interview? What are your impressions on the way the interview unfolded? Do you have any questions, comments, etc.?

18. IF YOU HAVE ANY FURTHER QUESTIONS you'd like to ask the participant, please ask them now, writing down both the question asked and the response provided.

Question #1:

Answer:

Question #2:

Answer:

Question #3:

Answer:

Question #4.

Answer:

Appendix D: DSM-IV Pathological Gambling Criteria (Self-Rated)

Please ask the participant the following DSM-IV based questions, recording his or her responses (YES / NO) and any information that would help provide greater understanding of the response. Note that the time frame for all questions is the PAST THREE MONTHS.

1. Have there been periods in the PAST THREE MONTHS when you spent a lot of time thinking about past gambling experiences, thinking about future gambling ventures, or thinking about ways of getting money with which to gamble?

YES / NO

Comment:

2. During the PAST THREE MONTHS, have you needed to gamble with larger amounts of money or with larger bets in order to obtain the same feeling of excitement?

YES / NO

Comment:

3. During the PAST THREE MONTHS, have you tried to cut down or stop your gambling several times and been unsuccessful?

YES / NO

Comment:

4. During the PAST THREE MONTHS, did you feel quite restless or irritable after you tried to cut down or stop gambling?

YES / NO

Comment:

5. During the PAST THREE MONTHS, did you feel that you gambled as a way to run away from personal problems or to relieve uncomfortable emotions, such as nervousness or sadness?

YES / NO

Comment:

6. During the PAST THREE MONTHS, after you lost money gambling, did you often return another day to try to win back your losses?

YES / NO

Comment:

7. During the PAST THREE MONTHS, did you lie to family members, friends or others in order to hide your gambling from them?

YES / NO

Comment:

8. During the PAST THREE MONTHS did you commit any illegal acts (such as theft, forgery, embezzlement or fraud) to finance your gambling?

YES / NO

Comment:

9. During the PAST THREE MONTHS, did you almost (or actually) lose a relationship with someone important to you, or a job-, school- or career- opportunity because of gambling?

YES / NO

Comment:

10. During the PAST THREE MONTHS, have you relied on others to bail you out and pay your gambling debts or to pay your bills when you had financial problems caused by gambling?

YES / NO

Comment:

Appendix E: DSM-IV Pathological Gambling Criteria (Clinician Rated)

Please use the following grid and give your assessment of whether the respondent shows the following ten signs of excessive or problem gambling.

	Yes	No
Preoccupied with gambling (e.g., devoting considerable time (preoccupied with) to reliving past gambling experiences, planning the next venture or thinking of ways to get money with which to gamble)	☐	☐
Needs to spend increasing amounts of money on gambling in order to achieve the desired excitement or perceived benefits	☐	☐
Has repeated (several) unsuccessful efforts to control, cut back or stop gambling	☐	☐
Is restless or irritable when attempting to cut down or stop gambling	☐	☐
Gambles as a way of getting away from problems or relieving a dysphoric mood (e.g., feelings of helplessness, guilt, anxiety, depression)	☐	☐
After losing money gambling, often returns another day to try and win it back (i.e., "chasing" losses)	☐	☐
Lies to family members, therapist or others to conceal or minimize the extent of involvement with gambling	☐	☐
Has committed illegal acts such as forgery, fraud, theft or embezzlement to finance gambling	☐	☐
Has jeopardised (seriously) or lost a significant relationship, job, or educational or career opportunity because of gambling	☐	☐
Relies on others to provide money to relieve financial duress caused by gambling	☐	☐

Appendix F: Clinician's Rating or Adolescent's Gambling Severity

Please read the following problem gambling category descriptions and then rate the gambling/betting severity DURING THE LAST THREE MONTHS of the person you just interviewed, based on all the information you gathered during the interview and the participant's score on the DSM-IV based questions.

No gambling/betting

There are no gambling/betting behaviours.

No problem gambling/betting

Gambling/betting behaviours with no apparent risks and absolutely no problems. Gambling/betting seems to be only recreational.

Low gambling/betting problem severity

Gambling/betting behaviours cause a few problems and/or consequences, but they are not serious problems. For example:

- The individual is gambling/betting higher amounts of money, is spending more time gambling or is placing more importance on gambling/betting.
- The individual is more preoccupied with gambling/betting.
- The individual is losing the recreational aspect of gambling/betting behaviours.
- The individual is showing some problems associated with gambling/betting, but not serious enough to jeopardize their finances, relationships or school functioning.

Moderate gambling/betting problem severity

There are indications that the person has difficulty controlling their gambling/betting and have a progressive to moderate loss of control. Gambling/betting behaviours cause a number of problems and/or consequences, which are moderate in terms of severity. For example:

- The individual has difficulty controlling the amount of time and money spent gambling.
- Gambling/betting has caused a moderate level of psychological distress, such as anxiety, depression, guilt, etc.

- Gambling/betting has caused moderate problems in one or more of the individual's life function areas, such as school, relationships and/or finances.
- There are no serious illegal activities directly associated with gambling/betting.

High gambling/betting problem severity

The individual is unable to control their gambling; there is a significant and serious loss of control. Gambling/betting behaviours cause a number of serious problems and/or consequences. Respondents in this group are those who have experienced important consequences from their gambling. For example:

- The individual is unable to control the amount of time and money spent gambling.
- Gambling/betting has caused serious psychological distress, such as anxiety, depression, guilt, etc.
- Gambling/betting has caused serious problems in one or more of the areas of the individual's life function areas, such as school, relationships and/or finances.
- There may be illegal activities directly associated with gambling/betting, such as theft.
- The individual may continue to gamble/bet in spite of the adverse consequences.

Rating

Please select the problem gambling category the participant fits into by circling a number on the following scale. For example, if you think the participant belongs in the no gambling problem category, circle number 1. If you think the participant belongs in the low gambling problem category, circle a number from 2 to 4 (i.e., select 2 if you think the participant's gambling is closer to the no gambling problem category and 4 if you think it is closer to the moderate gambling problem category), and so on for the other problem gambling classifications.

No gambling	No gambling problem	Low gambling problem			Moderate gambling problem			High gambling problem		
0	1	2	3	4	5	6	7	8	9	10

Appendix G: Means Comparison of Subscales Scores

The comparisons of subscales means with a multivariate analysis of variance (MANOVA) illustrate differences between genders, age groups and an interaction between both (table A4). The inspection of table A5 shows that differences between age groups are particularly explained by scores of the 18 years old subgroup. This is why the statistics were redone, excluding this age group.

Table A4: *Multivariate and Univariate Analyses of Variance for CAGI Subscales (including 18-year-old Participants)*

Source	Multivariate			Univariate											
				Psychological consequences			Social consequences			Financial consequences			Loss of control		
	F	*p*	η^2	*F*	*p*	η^2	*F*	*p*	η^2	*F*	*p*	η^2	*F*	*p*	η^2
Gender (G)	7.53	.000	.039	2.56	.110	.003	8.49	.004	.011	7.79	.005	.010	24.45	.000	.032
Age (A)	3.54	.000	.028	2.01	.062	.016	1.76	.105	.014	.627	.709	.005	7.9	.000	.060
G x A	1.35	.118	.011	1.19	.311	.010	2.32	.032	.018	.810	.562	.007	1.34	.239	.011

Note: Multivariate *F* ratios were generated from Pillai's statistic.

Table A5: *Comparison of CAGI Subscales Scores by Age (including 18-year-old Participants)*

CAGI subscales	12 years old *n* = 71 Mean (*SD*)	13 years old *n* = 99 Mean (*SD*)	14 years old *n* = 116 Mean (*SD*)	15 years old *n* = 155 Mean (*SD*)	16 years old *n* = 149 Mean (*SD*)	17 years old *n* = 109 Mean (*SD*)	18 years old *n* = 55 Mean (*SD*)	Total *N* = 754 Mean (*SD*)
Psychological consequences	.98 (2.9)	.79 (1.9)	1.17 (2.5)	1.66 (3.02)	1.47 (3.11)	1.65 (2.93)	2.25 (4.02)	1.41 (2.92)
Social Consequences	.35 (1.27)	.28 (1.09)	.33 (1.39)	.40 (1.33)	.71 (2.22)	.43 (1.36)	1.04 (3.12)	.48 (1.72)
Financial consequences	.39 (.90)	.81 (1.74)	.87 (2.47)	.93 (2.22)	.74 (2.12)	.74 (1.79)	1.04 (2.83)	.80 (2.08)
Loss of control	.47[ab] (.97)	.72[c] (1.55)	1.07[d] (2.16)	1.41[a] (2.2)	1.32[e] (1.77)	1.46[b] (2.14)	2.75[bcde] (3.13)	1.27*** (2.09)

[abcde] Means in a row sharing superscripts are significantly different from each other at a $p < .05$ (Tukey post-hoc test). * $p < .05$. ** $p < .01$. *** $p < .001$.

Table A6 shows when the 18-year-old group is retrieved, there are still significant differences between genders and age groups—but only for the loss of control subscale. For this reason, percentiles are presented (see section 4) by gender for the loss of control subscale.

Table A6: *Multivariate and Univariate Analyses of Variance for CAGI Subscales (without 18-year-old Participants)*

Source	Multivariate			Univariate											
				Psychological consequences			Social consequences			Financial consequences			Loss of control		
	F	*p*	η^2	*F*	*p*	η^2	*F*	*p*	η^2	*F*	*p*	η^2	*F*	*p*	η^2
Gender (G)	4.43	.002	.025	1.51	.220	.002	1.91	.168	.003	3.18	.075	.005	14.57	.000	.021
Age (A)	2.45	.000	.018	1.55	.173	.011	1.34	.246	.010	.694	.628	.005	3.88	.002	.027
G x A	.892	.598	.006	1.41	.217	.010	.862	.507	.006	.176	.972	.001	.458	.807	.003

In order to evaluate the appropriateness of presenting percentiles by age groups for the loss of control subscale, post-hoc comparisons of loss of control subscale means by age were conducted (table A.7). This table shows differences between the 12-years-old and the 15 to 17-years-old groups, but a consistent pattern of differences didn't emerge. Loss of control subscale percentiles are then presented for the total group.

Table A7: *Comparison of CAGI Subscales Scores by Age (without 18-year–old Participants)*

CAGI subscales	12 years old *n* = 71 Mean (*SD*)	13 years old *n* = 99 Mean (*SD*)	14 years old *n* = 116 Mean (*SD*)	15 years old *n* = 155 Mean (*SD*)	16 years old *n* = 149 Mean (*SD*)	17 years old *n* = 109 Mean (*SD*)	Total *N* = 699 Mean (*SD*)
Psychological consequences	.98 (2.9)	.79 (1.9)	1.17 (2.5)	1.66 (3.02)	1.47 (3.11)	1.65 (2.93)	1.34 (2.81)
Social Consequences	.35 (1.27)	.28 (1.09)	.33 (1.39)	.40 (1.33)	.71 (2.22)	.43 (1.36)	.44 (1.55)
Financial consequences	.39 (.90)	.81 (1.74)	.87 (2.47)	.93 (2.22)	.74 (2.12)	.74 (1.79)	.78 (2.02)
Loss of control	.47[abc] (.97)	.72 [d] (1.55)	1.07 (2.16)	1.41 [ad] (2.2)	1.32[b] (1.77)	1.46 [c] (2.14)	1.15** (1.94)

[abcde] Means in a row sharing superscripts are significantly different from each other at a $p < .05$ (Tukey post-hoc test). * $p < .05$. ** $p < .01$. *** $p < .001$.