

The Co-occurrence of Depressive Symptoms and Alcohol Use for Adolescent Boys and  
Girls: An Investigation of the Role of Self-Regulation and Approach Behavior

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## Abstract

While many studies have been conducted on adolescent depressive symptoms and alcohol use, much of the research has examined these behaviors separately rather than examining their co-occurrence within individuals. In the present study, adolescents ( $N = 4412$ ; 49% female) were surveyed at four time points (grade 9, 10, 11, and 12) and growth mixture modeling was used to identify groups of individuals reporting various patterns of depressive symptoms and alcohol use across the high school years. Four groups were identified, including *co-occurrence* (higher depressive symptoms and higher alcohol use relative to peers, comprising 6.1% of boys and 7.1% of the girls in the sample), *pure depressive symptoms* (higher depressive symptoms and lower alcohol use; 12.7% of boys and 12.5% of girls), *pure alcohol use* (higher alcohol use and lower depressive symptoms; 20.9% of boys and 19.9% of girls), and *low co-occurrence* (lower depressive symptoms and alcohol use, 60.3% of boys and 60.5% of girls). Groups were compared on self-regulatory (i.e., delay of gratification) and approach behaviors. For both boys and girls, delay of gratification was the strongest predictor of group membership, with the co-occurrence group scoring the lowest and the low co-occurrence group the highest. This finding emphasizes the importance of assessing delay of gratification in the identification of high risk youth.

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## The Co-occurrence of Depressive Symptoms and Alcohol Use for Adolescent Boys and Girls: An Investigation of the Role of Self-Regulation and Approach Behavior

### **Overview:**

Adolescence is often associated with the onset of internalizing behaviors such as depressive symptoms (Kandel & Davies, 1982) as well as significant increases in externalizing behaviors such as alcohol use (Measelle, Stice, & Hogansen, 2006), making it a sensitive age period for investigating these behaviors. While many studies have been conducted on adolescent depressive symptoms and alcohol use, few studies have examined the co-occurrence of these two behaviors within the same individual. Of the studies on co-occurrence that have been conducted, most have focused on boys, at-risk, clinical, or pre-adolescent samples (e.g. Pardini, White, & Stouthamer-Loeber, 2007; Repetto, Zimmerman, & Caldwell, 2004; Rohde, Lewinsohn, & Seeley, 1996; Wu et al. 2006). Importantly, research is limited on the role of self-regulation and approach as shared risk factors for depressive symptoms and alcohol use. The current study will address this gap by examining trajectories of these two behaviors across the high school years, and looking at the role of self-regulation and approach behavior in differentiating among sub-groups of adolescent boys and girls that indicate higher scores than their peers over time on both problem behaviors (i.e., co-occurrence) or just one problem behavior (i.e., pure depressive symptoms, pure alcohol use).

### **The Link between Depressive Symptoms and Alcohol Use in Adolescence**

Most of the research on depressive symptoms and alcohol use among adolescents has examined these behaviors separately. However, positive correlations have been found between depressive symptoms and alcohol use among this age group (Fergusson,

Goodwin, & Horwood, 2003; Marmorstein, 2010). As a result, researchers increasingly have attempted to understand why the two behaviors might be linked (Swendsen & Merikangas, 2000). One hypothesis for why depressive symptoms and alcohol use are linked in adolescence is because they share common risk factors. For example, a great deal of attention has been paid in recent years to the role of self-regulation and reward-seeking in adolescent problem behavior. Although self-regulation has been defined in a number of ways, the most pertinent to this study are effortful control and delay of gratification. Effortful control has been described as the efficiency of executive function, including the ability to inhibit a dominant response while activating a subdominant response (Rothbart & Bates, 2006). Similarly, delay of gratification is defined as showing a preference for a delayed more valuable reward *versus* an immediate but less valuable one (Mischel, Shoda, & Rodriguez, 1989). In contrast, reward-seeking or approach are conceived as the tendency to pursue rewards and to actively seek out new situations.

### **The Dual Systems Model**

According to the Dual Systems Model (Steinberg, 2008, 2010), increases in problem behaviors such as alcohol use in adolescence may be the result of a temporal gap between an early maturing socio-emotional system (hypothesized to be a result of increases in the sensitivity and efficiency of the dopaminergic system, perhaps linked to puberty, leading to increases in approach and reward seeking behavior), and a slower maturing self-regulatory system (hypothesized to be led by the prefrontal cortex, associated with delay of gratification, which may not be fully mature until the mid 20s). In other words, the greater maturity of the socio-emotional system in early adolescence is thought to lead to increased reward-seeking and approach behavior that may challenge

the still developing cognitive control system, such that the ability to self-regulate is compromised (Spear, 2000; Steinberg, 2008, 2010). Evidence in support of this hypothesis comes from longitudinal studies that have shown that reward-seeking and approach behaviors increase from age 12 to 15 and then remain relatively stable across adolescence until slowly declining in the 20s, while impulsivity (related to problems with self-regulation and delay of gratification) tends to be highest in childhood and then declines steadily across the adolescent and young adult years (Harden & Tucker-Drob, 2011; Steinberg, 2008, 2010). Importantly, support for the dual systems model also comes from the risk taking literature. Consistently, adolescents with lower levels of self-regulation have been found to be more likely than their peers to engage in risk taking behaviors, such as alcohol use (e.g., Casey, Getz, & Galvan, 2008; Spear, 2000; Wills & Stoolmiller, 2002).

### **Adolescent Self-Regulation, Approach, and Problem Behaviors**

Kremen and Block (1998) support the assertion that individuals low in self-regulation may be prone to risk taking behaviors such as alcohol use. However, Kremen and Block also suggest that self-regulation might lie on a spectrum from over-control to under-control, where each end of the spectrum is associated with different problem behaviors. Specifically, they characterize over-controlled individuals as being *low* in approach behavior (i.e., a high threshold for inhibition), and having a propensity to *overly* delay gratification. In such a case, over-controlled individuals might indiscriminately inhibit positive as well as negative emotions, putting them at greater risk than their peers for depressive symptoms. Support for this hypothesis has been found in a number of studies (Murray & Kochanska, 2002; Wilson, Lengua, Tininenko, Taylor, & Trancik,

2009). For example, Murray and Kochanska (2002) examined differences in self-regulation (low, moderate, high effortful control) with respect to internalizing (i.e., depressive symptoms) and externalizing problem behaviors (i.e., conduct problems) in a sample of children aged 2.5-5.5 years. Their results indicated that the low effortful control group (i.e., under-controlled) had the highest number of externalizing behaviors, the high effortful control group (i.e., over-controlled) had the highest number of internalizing behaviors, and the moderate effortful control group had the fewest problem behaviors. Wilson and colleagues (2009), in a sample of children aged 8 to 11, found the same pattern of association for over-controlled and under-controlled individuals. Both studies demonstrated that over time the moderate profile was the most well-adjusted, the low profile showed increases in externalizing behaviors, and the high profile showed increases in internalizing behaviors.

In contrast, other researchers have suggested that *low* self-regulation is a risk factor for emotional problems (Kaslow, Rehm, Pollack, & Siegel, 1988; Moriya & Tanno, 2008). Specifically, low effortful control has been shown to predict internalizing behaviors such as depressive symptoms in young children, preadolescents, and adolescents (Eisenberg et al., 2007; Pitzer, Jennen-Steinmetz, Esser, Schmidt, & Laucht, 2011; Verstraeten, Vasey, Raes, & Bijttebier, 2009; Wang, Brinkworth, & Eccles, 2012).

Furthermore, Tice, Bratslavsky, and Baumeister (2001) and Ernst, Pine, and Hardin (2006) suggest that adolescents who exhibit depressive symptoms, in an effort to reduce emotional distress, may be more likely to focus on the immediate present and short-term rewards than they are to prioritize long-term goals. As a result, adolescents with depressive symptoms may turn to activities that promise immediate pleasure, such

as alcohol use, in an effort to enhance their mood (e.g., self-medicate). To test this hypothesis, across three studies Tice et al. (2001) induced negative mood with two groups of participants, one of which was randomly assigned to believe that they could alter their mood by engaging in certain behaviors, and one of which was randomly assigned to believe that they could not alter their mood by engaging in certain behaviors. After instructions, the group that was told that they could alter their mood resorted to eating fattening snacks, sought immediate gratification, and engaged in procrastination. In contrast, the group that was told that their mood was immutable did not engage in any of these behaviors to reduce negative affect. These results support the hypothesis that when emotional distress is seen as changeable, responding to immediate impulses as a means of alleviating negative affect shifts an individual's priority from pursuit of long term goals to short-term affect regulation.

The self-medication hypothesis ties in with this assertion, in that negative emotions are thought to provide adolescents with a strong motivation to self-medicate (e.g., through alcohol use) so as to minimize depressive symptoms. In other words, individuals may have co-occurrence of depressive symptoms and alcohol use because depressive symptoms are thought to be alleviated by alcohol use. In this case, individuals seem to be responding to immediate impulses and short-term goals. There have been mixed findings in the literature with regard to the self-medication hypothesis, although many of these studies have included composite variables encompassing several health-risk behaviors (e.g., alcohol, smoking, and marijuana use; Measelle et al., 2006), rather than just alcohol use. Hooshmand, Willoughby, and Good (2012) explicitly tested the self-medication hypothesis with depressive symptoms and alcohol use with a longitudinal

sample of high school students, but found no support for the hypothesis. In fact, most adolescents increased their frequency and amount of alcohol use over the high school years, regardless of their levels of depressive symptoms in grade 9. Increases in alcohol use tend to be normative across high school and drinking often occurs during social activities such as parties (Hooshmand et al., 2012; Needham, 2007). As a result, drinking alcohol for some youth may be associated with enhanced social networks and feelings of belongingness. Of course, some youth may engage in alcohol use for self-medication reasons, but depressive symptoms also are often associated with social withdrawal; thus, some adolescents with higher depressive symptoms may be less likely than their peers to participate in the social situations that co-occur with alcohol use (Fleming, Mason, Mazza, Abbott, & Catalano, 2008; Lewinsohn, Pettit, Joiner, Thomas, & Seeley, 2003).

### **Variable-Centered Versus Person-Centered Analyses**

Hooshmand et al.'s (2012) lack of support for the self-medication hypothesis in their adolescent population highlights one of the problems with studies exploring the link between depressive symptoms and alcohol use. Most of the research has involved variable-centered analyses. For example, Hooshmand et al. (2012) used growth curve analyses to examine whether higher depressive symptom scores in grade 9 would predict greater increases over time in adolescent alcohol use than lower depressive symptom scores in grade 9. While variable-centered analyses are important for answering the questions of whether “depressive symptoms predict change over time in alcohol use” or whether “alcohol use predicts change over time in depressive symptoms”, it can not take into account heterogeneity (i.e., individual differences) among adolescents in the frequency with which they engage in each of these behaviors. It may be that some youth

engage in alcohol use because they are depressed, and therefore impulsively use alcohol to self-medicate, but it also may be that other youth engage in alcohol use only as a means of socializing with their friends and their alcohol use is not related to any depressive symptomatology. In other words, some youth may exhibit both depressive symptoms and alcohol use, while there might be others who exhibit only alcohol use or only depressive symptoms. With variable-centered analyses, however, the focus is on the average change in behavior across the sample of adolescents rather than on individual differences in patterns of behavior across youth.

One methodology, however, that can assess differences between people in these behaviors is called person-centered analysis. Person-centered analyses have the person, rather than the variable, as the main unit of interest (Bergman & Magnusson, 1997). That is, while variable-centered analyses focus on the average change over time across the entire sample of adolescents, person-centered analyses assess sub-group heterogeneity (i.e., is there a group of youth who exhibit co-occurring alcohol use and depressive symptom behaviors, a group of youth who exhibit depressive symptoms only, and a group of youth who exhibit alcohol use only)? Only by separating adolescents into these different groups of people can we actually assess the differential role of self-regulation and approach behavior for depressive symptoms versus alcohol use.

### **Co-Occurrence of Depressive Symptoms and Alcohol Use**

There have been few studies that have examined the co-occurrence of depressive symptoms and alcohol use within the same individual. Furthermore, none of these studies have explicitly examined how self-regulation and approach behavior are related to the co-occurrence of these behaviors. Instead, co-occurrence studies primarily have focused on

boys, at-risk, clinical, or pre-adolescent samples (e.g. Pardini et al. 2007; Repetto et al., 2004; Rohde et al., 1996; Wu et al. 2006). Thus, assessment of co-occurrence in a representative community sample is critical, including a focus on both boys and girls.

### **Gender Differences**

It has been well established in the literature that gender differences exist in frequency of depressive symptoms, with girls exhibiting higher rates of depression than boys (Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993; Ruchkin, Sukhodolsky, Vermeren, Koposov, & Schwab-Stone, 2006). In addition, girls and boys show different trajectories (i.e., change over time) of depressive symptoms from early childhood to late adolescence, with girls often exhibiting earlier onset than boys (Dekker et al., 2007). Several reasons might explain why girls report more depressive symptoms than boys. Boys may be more likely to express depressive symptoms through externalizing behaviors such as substance use (Gjerde, Block, & Block, 1988; Marcus et al., 2005). Boys also are less likely to ruminate than girls and rumination has been associated with increases in depressive symptoms (Nolen-Hoeksema, 2001; Nolen-Hoeksema, Morrow, & Fredrickson, 1993). Furthermore, depression scales often include questions about crying, appetite, or weight changes, which girls are more likely to report than boys (Parker & Brotchie, 2010).

In contrast, there are limited gender differences in rates of alcohol consumption (Biehl, Natsuaki, & Ge, 2007; Flory, Lynam, Milich, Leukefeld, & Clayton, 2004; Miller, Naimi, Brewer, & Jones, 2007). However, a study on depressive symptoms that incorporated alcohol use indicated that higher scores on depressive symptoms were associated with higher levels of drinking over time for both boys and girls (Owens &

Shippee, 2009), but the onset varied across gender such that higher levels of drinking were associated with higher levels of depressive symptoms for boys in grade 9 to 10 and for girls in grade 11 to 12. Therefore, overall, vulnerability to the co-occurrence of depressive symptoms and alcohol use during the high school years may differ across gender. Thus, gender is an important factor to assess when examining the co-occurrence of depressive symptoms and alcohol use in adolescence.

### **The Present Study**

The present study extended the literature by examining trajectories of depressive symptoms and alcohol use across the high school years in a large community sample, and looking at the role of self-regulation and approach behavior in differentiating among sub-groups of adolescent boys and girls that indicate higher scores than their peers over time on both problem behaviors (i.e., co-occurrence) or just one problem behavior (i.e., pure depressive symptoms, pure alcohol use). Specifically, differences in self-regulation (i.e., delay of gratification) and approach behavior were examined across gender among the co-occurring (higher scores than their peers on depressive symptoms and alcohol use), pure depressive symptom (higher scores than their peers on depressive symptoms but lower scores on alcohol use), pure alcohol use (lower scores than their peers on depressive symptoms but higher scores on alcohol use) groups, as well as a comparison group of youth, the low co-occurrence group (individuals indicating lower scores than their peers over time on both problem behaviors).

**Research questions and hypotheses:** The study addressed two primary questions.

**1) What is the prevalence of the co-occurrence of depressive symptoms and alcohol use in a sample of high school students?**

Depressive symptoms and alcohol use tend to have their onset in adolescence and increase during the high school years (Kandel & Davies, 1982; Measelle et al., 2006), but the prevalence of co-occurrence of these behaviors within the same individual remains unknown for a normative high school sample.

**2) Do self-regulation and approach behavior differentially predict membership in groups of individuals exhibiting co-occurring behaviors, depressive symptoms only, alcohol use only, or low levels of each behavior across gender?**

Differences in delay of gratification (the current study's index of self-regulation) and approach in grade 9 were compared across four groups: co-occurrence, pure depressive symptoms, pure alcohol use, and low co-occurrence. I hypothesized that the pure alcohol group would report lower delay of gratification scores and higher approach scores than their peers, consistent with past research and the dual systems model (Steinberg, 2008, 2010). The low group was expected to report the most positive scores on delay of gratification. It was not clear what self-regulation and approach behaviors might look like for the co-occurring and the pure depressive symptoms groups, however, given the mixed findings for depressive symptoms and the lack of research on the co-occurring group.

## **Methodology**

### **Participants**

Students from eight high schools encompassing a school district in Ontario, Canada, were surveyed in each grade of high school. This study was part of a larger cohort-sequential project, and involved 4,412 participants (49% females). The overall participation rate across the longitudinal study ranged from 83% to 86%. Non-

participation was due to student absenteeism (average of 13.5%), parental refusal (average of .06%), or student refusal (average of 1.4%). Consistent with the broader Canadian population (Statistics Canada, 2003), 92.4% of the participants were born in Canada, and the most common ethnic backgrounds reported other than Canadian were Italian (31%) and French (18%). Data on socioeconomic status indicated mean levels of education for mothers and fathers falling between “some college, university or apprenticeship program” and “completed a college/apprenticeship/technical diploma” (25% of parents were university graduates). Further, 70% of the respondents reported living with both birth parents, 12% with one birth parent and a stepparent, 15% with one birth parent (mother or father only), and the remainder with other guardians (e.g., other relatives, foster parents, etc.).

Because of the study’s cohort-sequential design, the sample included 3 cohorts. One cohort included students ( $N = 1469$ ) who entered high school in the academic year 2002/2003 and completed the survey when they were in grades 9, 11, and 12. The second cohort of students entered high school in the academic year 2003/2004 ( $N = 1231$ ) and completed the survey when they were in grade 10, 11, and 12. The third cohort of students ( $N = 1712$ ) entered high school in the academic year 2004/2005 and completed the survey when they were in grade 9, 10, 11, and 12. An examination of mean differences on the study measures depending on cohort revealed a significant difference only in grade 10, in which the second cohort reported significantly lower scores on the alcohol and depressive symptoms measures than the third cohort (Wilk’s  $\lambda < .001$ ). However, the magnitude of the between-group difference was small (mean difference of .24 for alcohol,  $\eta^2 = .031$ , and .13 for depressive symptoms,  $\eta^2 = .008$ ). As differences

among cohorts were limited, all analyses combined students across cohorts into one sample. Cohort, however, was included as a covariate in all analyses.

Participants who completed the survey at all time periods were not significantly different from participants missing one, two, or three waves on any of the study measures, with the exception that participants with complete data reported significantly less alcohol use in grade 9 than their peers (Wilks  $\lambda < .001$ ;  $\eta^2 = .015$ ). Again, the magnitude of these differences were small (mean difference of .08, .15, and .10 for comparisons with three-wave, two-wave, and one-wave participants, respectively).

### **Procedure**

Active informed assent was obtained from the adolescent participants. Parents were provided with written correspondence mailed to each student's home prior to the survey administration outlining the study; this letter indicated that parents could request that their adolescent not participate in the study. An automated phone message about the study also was left at each student's home phone number. This procedure was approved by the participating school board and the University Research Ethics Board. At all time periods, the questionnaire was administered to students in classrooms by trained research staff. Students were informed that their responses were completely confidential.

### **Measures**

Depressive symptoms and alcohol use were assessed in all four grades. Gender, parental education, at-risk background, delay of gratification, and approach were assessed in grade nine.

**Gender.** Gender of participants was assessed. Higher scores indicate female gender (1 = boy, 2 = girl).

**Covariates.** Parental education (one item per parent, averaged for those reporting on both parents,  $r = .45$ ) was assessed. Higher scores indicated greater parental education (1 = did not finish high school to 6 = professional degree). At-risk background was assessed as the number of risk factors that participants reported (i.e., participants were asked to indicate *yes* or *no* to the question of whether they have a learning disability, are living or have lived in foster care, started using marijuana prior to age 13, have parents/guardians who engage in narcotic use, had a teen mother, have parents who are depressed, or have parents who divorced). Higher scores indicated a greater number of risks. Cohort was also assessed as a covariate.

**Depressive Symptoms.** Depressive symptoms were measured in grades 9 through 12 using the Center for Epidemiological Studies Depression Scale (Radloff, 1977). Participants indicated how often they experienced 20 symptoms (e.g., “I could not get going”) over the past two weeks using a 4-point scale, 1 = *never* to 4 = *always*. The scale has been shown to have good reliability with adolescent samples (Gil-Rivas et al., 2003, Greenberger & Chen, 1996, Kim & Ge, 2000). Cronbach’s alphas for boys in grades 9, 10, 11, and 12 were .90, .91, .92, .93, respectively. Cronbach’s alphas for girls were .93, .92, .92, .92. Ratings were averaged such that higher scores indicated greater reported depressive symptoms.

**Alcohol Use.** Alcohol use was measured in grades 9 through 12 by frequency of use with an 8-pt scale, with 1 = never to 8 = every day, and average consumption per drinking episode was assessed with a 6-pt scale, with 1 = less than 1 drink to 6 = 4 or more drinks. The scores on the 8-pt scale were re-coded to a 6-pt scale and then the two items were averaged. Correlations between frequency of use and average consumption

per episode in grades 9, 10, 11, and 12 were .69, .70, .65, .68 for boys and .74, .71, .68, .66, for girls, respectively. Higher scores represented higher alcohol use.

**Delay of Gratification.** Delay of gratification was measured in grade 9 with 5 items (e.g., “I usually do what I want when I want to, I don’t think about what it will mean to me later”), on a 5-pt scale, 1 = *usually* to 5 = *never*. The Cronbach’s alpha was .74 for boys and .77 for girls. Higher scores represent more delay of gratification.

**Approach.** Approach was measured in grade 9 using a modified version of the Dimensions of Temperament Scale (Windle & Lerner, 1986) with 5 items (e.g., “I am interested in new objects shown to me”), on a 4-pt scale 1 = *never* to 4 = *always*. The Cronbach’s alpha was .71 for boys and .70 for girls. Higher scores represent higher approach.

### **Missing Data**

Missing data occurred across waves due to the cohort-sequential design of the larger study as well as absenteeism, and within waves because some students did not finish the entire questionnaire (10% of data, consistent with other longitudinal survey studies see Ciarrochi, Leeson, & Heaven, 2009; Feldman, Masyn, & Conger, 2009; Hyde & Peterson, 2009). In order to distribute the anticipated missing data due to survey length across survey scales, three versions of the survey were included at each time period so that the same scales were not always near the end of the survey. As missing data were not dependent on the values of the study measures, it is reasonable to assume that these data are missing at random (Little & Rubin, 2002; Schafer & Graham, 2002). Missing values were imputed using the EM (expectation-maximum) algorithm. EM is an iterative maximum-likelihood (ML) procedure in which a cycle of calculating means and

covariances followed by data imputation is repeated until a stable set of estimated missing values is reached. Methodological research has demonstrated that ML estimation is preferable to pair-wise deletion, list-wise deletion, or means substitution (Schafer & Graham, 2002).

### **Plan of analysis**

Preliminary analyses included descriptive statistics for all variables, inter-correlations, and checks of univariate and multivariate normality. Growth curve analyses were then conducted to test if average change over time for depressive symptoms and frequency of alcohol use were linear or non-linear. Separate analyses were conducted for boys and girls. A well-specified model fit was indicated by a comparative fit index (CFI) of  $>.95$  and a root-mean-square error of approximation (RMSEA) of  $<.06$  simultaneously (Hu & Bentler, 1999).

Growth mixture modeling was then conducted on the growth curve model for depressive symptoms, and then on the growth curve model for alcohol use, to identify if there were distinct trajectories over time within each behavior, again separately for boys and girls. Growth mixture modeling is a person-centered analysis that specifically explores sub-group heterogeneity in change over time in frequency of the behavior. In order to determine which number of trajectory groups were best represented by the data, several criteria were considered: a) Bayesian information criterion (BIC), such that smaller values of BIC indicate a better fit model, b) significance of the Lo-Mendell-Rubin Adjusted Likelihood Ratio Test (LMR-LRT), such that once non-significance is reached, the number of classes prior to non-significance are defined as the appropriate number, c) no classes contain less than 5% of the total sample, and d) that entropy (an

index of confidence that individuals belong to the correct class and adequate separation between latent classes exist) is greater than .80 (Jung & Wickrama, 2008; Nylund, Asparouhov, & Muthen, 2007).

Co-occurrence of behaviors was assessed separately for boys and girls by conducting a cross-tabs analysis to find the co-occurrence and pure groups. Groups were defined as co-occurrence (i.e., encompassing individuals who were in the "higher" group for both depressive symptoms and alcohol use relative to their peers), pure alcohol users (i.e., individuals who were in the "higher" group for alcohol use and "lower" group for depressive symptoms), pure depressive symptoms (i.e., individuals who were in the "lower" group for alcohol use and "higher" group for depressive symptoms), and low co-occurrence (i.e., individuals who were in the "lower" group for both behaviors).

To examine whether delay of gratification and approach predicted membership among the four groups, univariate group comparisons were then conducted using one-way ANOVAs for delay of gratification, approach, and the covariates. Further, these measures were simultaneously entered into a discriminant function analysis (DFA), along with the covariates of at-risk background factors and parental education, in order to examine which variables best discriminate among the four groups. DFA can be thought of as the opposite of MANOVA. Rather than comparing scores on dependent variables for significant differences, scores on study variables were used to predict group membership.

## **Results**

### **Preliminary Analyses**

**Descriptive statistics and correlations.** The data screen for univariate outliers revealed 1.2-1.5% outliers for the depressive symptoms variable (i.e., z-scores higher than 3.3) and .015-1.3% for the alcohol use variable across the high school years; however, it was expected that there would be some individuals with higher scores on the depressive symptoms and alcohol use variables (Kandel & Davies, 1982; Measelle et al., 2006). We also found 1.5% outliers for delay of gratification and 0.16% for approach. Despite outliers, all variables demonstrated acceptable univariate skewness and kurtosis (Kline, 2005). To determine whether these cases were multivariate outliers, a Mahalanobis Distance value was calculated for each case. Since no cases had both a very large standardized score and/or an extreme Mahalanobis Distance value distinctively different from other cases, all 4412 participants were included in the primary analyses.

Table 1 presents the means and standard deviations of the variables. Students generally reported low levels of depressive symptoms and alcohol use (i.e.,  $M = 1.89$ ,  $M = 1.80$ , respectively) in grade 9 but scores increased over time. There were no gender differences across any of the grade 9 variables (depressive symptoms, alcohol use, delay of gratification, approach) except for depressive symptoms ( $F = 123.04$ ,  $p < .001$ ,  $\eta^2 = .027$ ), with girls showing a higher mean than boys. For grades 10, 11, and 12, girls reported significantly greater depressive symptoms than boys (all  $ps < .001$ ,  $\eta^2$  ranged from .003 to .034), but boys reported significantly greater alcohol use than girls (all  $ps < .001$ ,  $\eta^2$  ranged from .019 to .059).

Table 2 presents the inter-correlations between variables separately for boys and girls. Overall, girls had stronger correlations for all variables when compared to boys. For

example, girls tended to have higher stability over time in depressive symptoms and alcohol use than boys.

### **Primary Analyses**

**Univariate growth trajectories.** Separate growth models were identified for depressive symptoms and alcohol use by first testing each variable on a linear growth model, in which the paths from the slope factor to the measured variables were fixed in a linear progression (i.e., 0 = grade nine; 1 = grade 10; 2 = grade 11; 3 = grade 12), followed by a model in which the slope factor was replaced with a shape factor so as to test non-linearity (Duncan, Duncan, Strycker, Li, & Alpert, 2006), in which the loadings were set to 0 in grade 9, 1 in grade 12, and freely estimated in grades 10 and 11. For each of the models, the intercept factor loading was set to 1 at all time points. Thus, the mean of the intercept represents the average score for the sample at the starting point (i.e., grade 9) of the trajectory, whereas the mean of the slope represents the average rate of change from grade 9 to 12.

Chi-square difference tests were conducted to compare the model with the linear slope factor to the model with the shape factor for depressive symptoms for both boys and girls. The results revealed that the difference tests were significant (boys:  $\chi^2 \text{ diff}(2) = 20.58, p < .001$ , girls:  $\chi^2 \text{ diff}(2) = 31.64, p < .001$ ), and therefore the models with the shaped slope factor were the more parsimonious choice for depressive symptoms across gender. Furthermore, the fit for the shaped model was well-specified for both boys and girls, CFI = .98; RMSEA = .044 (.032-.056) and CFI = .99; RMSEA = .046 (.034-.058), respectively.

Chi-square difference tests were also conducted to compare the model with the linear slope factor to the model with the shape factor for alcohol use for both boys and girls. The results revealed that the difference tests were significant (boys:  $\chi^2 \text{ diff}(2) = 212.43, p < .001$ , girls:  $\chi^2 \text{ diff}(2) = 113.46, p < .001$ ), and therefore the models with the shaped slope factor were the better fit for alcohol use across gender. Specifically, the fit for the shaped model was well-specified for boys, CFI = .92; RMSEA = .063 (.052-.076), and acceptable for girls, CFI = .90; RMSEA = .087 (.075-.099). Graphs for these models can be found in Figure 1. These graphs indicate that depressive symptoms and alcohol use increase across adolescence, with alcohol use representing the largest growth over time.

**Growth mixture modeling.** Examination of the growth curve analyses for depressive symptoms and alcohol use, across gender, revealed that the estimated variances of the intercepts and shape factors in the models were all significantly different from zero. This finding indicated that there was significant variability in individual trajectories, and therefore substantiated the use of growth mixture modeling to examine sub-group heterogeneity.

For both boys and girls, the best-fitting model for depressive symptoms contained two classes. See Figure 2. For boys, the two class model showed the best fit as the LMR-LRT was non-significant at three classes, and one of the class sizes dropped below 5% in the three class model. For girls, the two class model showed the best fit as one of the class sizes dropped below 5% in the three class model. The growth mixture model fit indices can be found in Table 3. For boys, individuals in the first class (19%) showed relatively higher scores in grade 9 than their peers with little change over time (higher-

stable), while individuals in the second class (81%) were characterized by relatively lower scores on depressive symptoms in grade 9 than their peers followed by a slight increase over time (lower-stable). For girls, individuals in the first class (21%) were characterized by relatively higher scores in grade 9 than their peers followed by a slight decrease over time (higher-stable), while individuals in the second class (79%) were characterized by relatively lower scores on depressive symptoms in grade 9 than their peers with a slight increase over time (lower-stable).

The best-fitting models for alcohol use contained three classes for both genders. See Figure 2. For boys, the three class models showed the best fit as the LMR-LRT was non-significant at four classes, and one of the class sizes dropped below 5% in the four class model. For girls, the three and four class models showed the best fit as the required criteria were met; however, the variability was near zero between the third and fourth classes. This is problematic and leaves the fourth class not well identified since reliable regression coefficient estimates can not be generated (Muthen, 2005). The three class model, therefore, was chosen as the best fitting for girls. For boys, individuals in the first class (6%) were characterized by higher scores on alcohol use in grade 9 than their peers followed by a slight decrease over time (higher-stable), individuals in the second class (21%) was characterized by moderate scores in grade 9 followed by an increase over time (moderate-increasing), and individuals in the third class (73%) showed relatively low scores in grade 9 with an increase over time (lower-increasing). For girls, individuals in the first class (6%) were characterized by higher scores in grade 9 followed by a moderate decrease over time (higher-decreasing), individuals in the second class (21%) were characterized by moderate scores on alcohol use in grade 9 with a slight increase

over time (moderate-increasing), and individuals in the third class (73%) were characterized by relatively low scores in grade 9 followed by an increase over time (low-increasing).

**Group profiles.** To create the co-occurring groups, for both boys and girls, we cross-tabulated adolescents' membership in the depressive symptoms groups with their membership in the alcohol use groups. Four groups were created for both boys and girls: co-occurrence, pure depressive symptoms, pure alcohol use, and low co-occurrence. The co-occurrence group for each gender first was created by including only individuals who were in the higher-stable groups for both behaviors for boys, and in the higher-stable and higher-decreasing groups for depressive symptoms and alcohol use, respectively, for girls. This co-occurrence group, however, represented less than 5% of the sample. As a result, and as per Chen & Simons-Morton (2009), we combined the higher-stable and moderate-increasing alcohol groups for boys, and the higher-decreasing and moderate-increasing alcohol groups for girls, and created the co-occurrence group for each gender by including individuals who were in this combined alcohol group as well as in the higher-stable group for depressive symptoms. A pure depressive symptoms group was created for each gender by including individuals who were in the higher-stable group for depressive symptoms but in the lower-increasing group for alcohol use. In contrast, a pure alcohol group was created for each gender by including individuals who were in the combined higher and moderate group for alcohol use but in the lower-stable group for depressive symptoms. The remaining individuals were placed in the low occurrence group for each gender. Sample sizes for the four groups were as follows: for boys, co-occurrence = 6.1%, pure depressive symptoms group = 12.7%, pure alcohol use = 20.9%,

and low co-occurrence = 60.3%, and for girls, co-occurrence = 7.1%, pure depressive symptoms group = 12.5%, pure alcohol use = 19.9%, and low co-occurrence = 60.5%. Chi-square analyses indicated that there were no significant differences in the percentage of boys and girls in each of the four groups (all  $\chi^2$ 's  $>.05$ ).

**Univariate group comparisons.** Univariate group comparisons (one-way ANOVAs) and follow-up pairwise contrasts (Tukey) were used to examine differences among the groups on each of the study variables, for boys and girls separately. A significance level of  $p < .013$  was used to correct for multiple comparisons. Means and standard deviations for each of the groups are displayed in Table 4.

For boys, overall group differences were significant for delay of gratification,  $F(3, 2240) = 21.23, p < .001, \eta^2 = .028$ , approach,  $F(3, 2240) = 6.01, p < .001, \eta^2 = .008$ , and at-risk background,  $F(3, 2240) = 3.67, p = .012, \eta^2 = .005$ . Follow-up Tukey analyses revealed that the low co-occurrence group had significantly higher delay of gratification scores than the co-occurrence and pure groups. For approach, the low co-occurrence and pure alcohol groups had significantly higher approach scores than the co-occurrence group. Finally, for at-risk background, the co-occurrence group had significantly higher at-risk background scores than the pure and low co-occurrence groups. There were no other significant differences.

For girls, overall group differences were significant for all the variables at  $p < .001$ : delay of gratification,  $F(3, 2167) = 84.12, \eta^2 = .104$ ; approach,  $F(3, 2167) = 17.02, \eta^2 = .023$ ; at-risk background,  $F(3, 2167) = 9.90, \eta^2 = .014$ ; and parental education,  $F(3, 2167) = 5.70, \eta^2 = .008$ . Follow-up Tukey analyses revealed that the low co-occurrence group had significantly higher delay of gratification scores than the co-occurrence and

pure groups, and the pure groups had significantly higher delay of gratification scores than the co-occurrence group. For approach, the low co-occurrence and pure alcohol groups had significantly higher approach scores than the co-occurrence and pure depressive symptoms group. The low co-occurrence group also had significantly higher parental education but lower at-risk background than the co-occurrence and the pure depressive symptoms groups. There were no other significant differences.

**Multivariate analyses.** To examine which variables best discriminated among the 4 groups (co-occurrence, pure depressive symptoms, pure alcohol use, and low co-occurrence), delay of gratification, approach, and the covariates (at-risk background and parental education) were simultaneously entered into a discriminant function analysis. Again, separate analyses were conducted for each gender. There was one significant discriminant function for boys (Wilk's  $\lambda = .961, p < 0.001$ ) and two for girls (Wilk's  $\lambda = .867, p < 0.001$ , Wilk's  $\lambda = .986, p < 0.001$ ), indicating that, overall, the study variables differentiated among the groups.

The first discriminant function is the function that maximally separates the four groups, and it explained 86.2% and 90.3% of the separation among groups for boys and girls, respectively. An examination of the discriminant function means (i.e., centroids) for the co-occurrence, pure depressive symptoms, pure alcohol, and low co-occurrence groups (-.442, -.247, -.126, .141 for boys, and -.990, -.384, -.194, .260 for girls, respectively) indicated that for both boys and girls the distance between each of the four groups was relatively monotonic (although for girls the pure groups were closer to each other than to the co-occurrence or the low co-occurrence groups, and the magnitude of the difference was larger than for boys), with the greatest separation between the co-

occurrence and low co-occurrence groups. The variable making the most notable, unique contribution to the first discriminant function in the context of all study measures (i.e., standardized discriminant function coefficient of 0.10 or greater) was delay of gratification (.863 for boys and .894 for girls), such that for both genders the highest delay of gratification scores were associated with the low co-occurrence group, and the lowest delay of gratification scores with the co-occurrence group, with the pure groups more in the middle. Approach (.392 and .282 for boys and girls, respectively) and at-risk background (-.199 and -.254 for boys and girls, respectively) also made notable, unique contributions to the first discriminant function for both boys and girls, with the low co-occurrence group having the highest approach and lowest at-risk background scores and the co-occurrence group having the lowest approach and highest at-risk background scores.

The second function is orthogonal to the first function, maximally accounting for variance not explained by the first function. The second function explained 8.8% of the separation for girls. For girls, an examination of the discriminant function means (i.e., centroids) for the pure alcohol, low co-occurrence, co-occurrence, and pure depressive symptoms groups (.204, -.023, -.032, -.192 respectively) indicated that the second function discriminated most between the pure alcohol (.204) and the pure depressive symptom groups (-.192). The variable making the most notable, unique contribution to the second discriminant function for girls was approach (.910), such that higher approach scores were associated with the pure alcohol group relative to the pure depressive symptoms group.

## **Discussion**

The present study extended the current literature by determining the prevalence of the co-occurrence of depressive symptoms and alcohol use in a normative adolescent sample and by assessing the role of self-regulation (i.e., delay of gratification) and approach behavior in the prediction of co-occurrence. Discussion of the results of the two primary research questions is addressed below.

**Question one: What is the prevalence of the co-occurrence of depressive symptoms and alcohol use in a sample of high school students?**

Although research indicates that depressive symptoms and alcohol use begin and increase in adolescence (Kandel & Davies, 1982; Measelle, et al., 2006), it was not previously known to what extent these behaviors co-occur within the same individuals, specifically for a normative sample of high school-aged youth. Past research on the co-occurrence of depressive symptoms and alcohol use has focused on non-normative samples such as those with clinical diagnoses where prevalence has been shown to be between 23-63% for youth aged 14-18 and 10-24% for pre-adolescents aged 10-13 (e.g., Rohde et al., 1996; Wu et al., 2006). The results of the current thesis indicated that the majority of adolescents were not experiencing high levels of depressive symptoms or engaging in high levels of alcohol use. The percentage of boys and girls reporting higher levels of both behaviors relative to their peers, therefore, was small (6-7%) in comparison to the clinical samples noted above.

Consistent with past research, girls reported higher *overall* mean levels of depressive symptoms than boys and boys reported higher *overall* mean levels of alcohol use than girls in grades 10 through 12, although these mean differences were small (see also Biehl et al., 2007; Flory et al., 2004; Miller et al., 2007). Yet both boys and girls

showed similar trajectories of depressive symptoms and similar trajectories of alcohol use. Moreover, the prevalence rates for boys and girls in each of the four groups (i.e., co-occurrence, pure depressive symptoms, pure alcohol, low co-occurrence) were not significantly different. For example, approximately 6.5% of boys and girls were in the co-occurrence group, 13% of boys and girls were in the pure depressive symptoms group, and approximately 20% of boys and girls were in the pure alcohol use group. That the prevalence of co-occurrence was so similar across boys and girls supports the assertion that the gender gap in these behaviors may be narrowing (e.g., Flory et al., 2004; Kessler et al., 1994, Kessler, Chiu, Demler, & Walters, 2005; Miller et al., 2007; Stoolmiller, Kim, & Capaldi, 2005).

**Question two: Do delay of gratification and approach behavior differentially predict membership in groups of individuals exhibiting co-occurring behaviors, depressive symptoms only, alcohol use only, or low levels of each behavior across gender?**

Overall, across both boys and girls, delay of gratification was by far the strongest predictor of group membership relative to all the study measures. The greatest difference on delay of gratification was seen between the co-occurrence and low co-occurrence groups. This finding supports the hypothesis that self-regulation (i.e., delay of gratification) is a common risk factor for depressive symptoms and alcohol use in adolescence (Spear, 2000; Wang et al., 2012; Wills & Stoolmiller, 2002) and supports the expectations outlined by the Dual Systems Theory. Therefore, assessment of delay of gratification may be particularly relevant for making distinctions between adolescents who might be at risk for exhibiting both depressive symptoms and alcohol use

Higher at-risk background and lower approach also were notable predictors of group membership, with the largest difference again between the co-occurrence and the low co-occurrence group. Not surprisingly, individuals who live in environments containing a greater number of risks might be expected to have more problem behaviors relative to their peers (Cicchetti & Toth, 1998; Greenberg, Speltz, DeKlyen, & Jones, 2001). Furthermore, previous research has indicated that depressive symptoms are often associated with social withdrawal (Fleming et al., 2008; Lewinsohn et al., 2003), which might explain why lower levels of approach were reported for the co-occurrence group as compared to the low-occurrence group. Given this, it may be that individuals in the co-occurring group might be more likely to drink in order to self-medicate. While previous research using variable-centered analysis has not found support for the self-medication hypothesis (e.g., Hooshmand et al., 2012), the person-centered analysis employed in the present study specifically allowed for the examination of sub-group heterogeneity. Thus, it is possible that individuals with co-occurring behaviors might represent a sub-group of alcohol users that drink to reduce depressive symptoms, which has not been captured in other variable-centered studies.

When comparing the pure groups to the co-occurrence and low co-occurrence groups, there were mixed findings. Descriptively, the scores for the pure groups tended to be in-between the co-occurrence and low co-occurrence groups on the study measures. For example, with the most important predictor, delay of gratification, girls in the pure groups were clearly distinguished from the co-occurrence at the one end, and low co-occurrence at the other end. For boys, however, the pure groups were significantly different only from the low co-occurrence group, in that the pure groups had lower delay

of gratification than the low co-occurrence group. In contrast, for at-risk background and approach, the pure groups for both boys and girls tended to be more similar to the low co-occurrence group than to the co-occurrence group in that they had lower at-risk background and higher approach than the co-occurrence group, with the exception of approach for the pure depressive symptoms group. Overall, therefore, the predictors most consistently discriminated between the co-occurrence and low-occurrence groups rather than the pure groups, suggesting that self-regulation and approach scores may be best for predicting individuals at risk for experiencing both higher depressive symptoms and higher alcohol use than their peers

Moreover, there were no significant differences between the pure depressive symptoms and pure alcohol groups on the study measures, other than girls in the pure alcohol use group that reported higher levels of approach than girls in the pure depressive symptoms group. This latter result again supports the finding from past research that individuals reporting depressive symptoms are more likely than their peers to be socially withdrawn (Fleming et al., 2008; Lewinsohn et al., 2003), and suggests that approach rather than the other measures assessed in the present study might be one way to discriminate between the pure depressive symptoms and pure alcohol groups.

Interestingly, in contrast to findings reported by Murray and Kochanska (2002) and Wilson et al. (2009), in no case was higher delay of gratification associated with higher depressive symptoms (i.e., over-control). While my thesis used a person-centered analysis and a similar conceptualization of delay of gratification as that used in these previous studies, it varied in the age range of participants (adolescents versus young children or pre-adolescents) and methodology used. In particular, the present study used

self-report measures whereas Murray and Kochanska (2002) and Wilson et al. (2009) used parent and teacher reports for problem behaviors (e.g., depressive symptoms) and researcher observations for delay of gratification. Inferring depressive symptoms from mother or teacher reports may be more difficult than using self-report measures as depressive symptoms can be challenging to accurately observe. Additionally, the different results found for delay of gratification could be associated with experimenter effects. That is, during the delay tasks, the younger children in previous research were observed by the researchers and as such may have delayed gratification longer to receive approval from the experimenters. The adolescents in the present sample were not observed but rather self-reported on their delay of gratification and were not likely to be subject to experimenter effects. In this instance, adolescent self-reports on delay of gratification could potentially be less biased.

In general, the pattern of findings in the study also were remarkably consistent across gender as delay of gratification and approach were important predictors of problem behavior for both boys and girls. In conjunction with the similar prevalence rates of boys and girls in each of the four groups, this indicates that boys and girls are comparable in their trajectories of alcohol use and depressive symptoms, as well as its co-occurrence, and highlight the importance of assessing both delay of gratification and approach for identifying at-risk boys and girls.

### **Limitations of the present study**

While the current study may be the first to assess the prevalence of the co-occurrence of depressive symptoms and alcohol use in a normative sample, and the first to assess the role of delay of gratification and approach in the prediction of co-

occurrence, it is not without limitations. First, the present study, while longitudinal, is correlational and does not allow for inferences about causation. Furthermore, the direction of effects between the variables was not assessed, and as such three possibilities could exist. First, individuals with co-occurring behaviors may have lower delay of gratification and approach as a result of experiencing difficulty from both problem behaviors. Second, the lower delay of gratification and approach could be the reason for the development of both problem behaviors. Lastly, both problem behaviors, delay of gratification, and approach behavior could be driven by potential third variables, such as traumatic life events (e.g., childhood abuse), among others.

A second limitation is that the majority of our sample (60%) reported relatively low levels of depressive symptoms and alcohol use (i.e., the low co-occurrence group) and only a small minority (6-7%) reported higher levels of both behaviors than their peers (i.e., the co-occurrence group). The discrepancy in sample size between the two groups may have affected our results, although because of the large number of participants in the present study, the numbers of individuals in the co-occurrence group was still large for both boys ( $N = 137$ ) and girls ( $N = 154$ ).

Another limitation is that the measure of approach used in the current thesis may more aptly measure novelty seeking or social withdrawal (e.g., “I like trying new things” or “I like meeting new people”) than sensation seeking or reward sensitivity. According to the Dual Systems Theory (Steinberg, 2008, 2010), risk taking behaviors such as drug use or reckless driving are associated with increased reward sensitivity or sensation seeking, and therefore may not necessarily imply novelty seeking or the seeking out of new situations. Thus, a difference in the predictive utility of approach might have been

seen had the measure incorporated items assessing reward sensitivity or sensation seeking.

Furthermore, a limitation of the present study is that while the findings support the hypothesis of delay of gratification and approach as common risk factors for problem behavior in adolescence, these measures were only assessed at one time point – grade 9. It is important for future studies to include longitudinal assessments of delay of gratification and approach. Establishing trajectories of these measures across the high school years could provide additional information regarding the development of co-occurring problem behaviors. It might also provide information regarding the developmental progression of delay of gratification and approach to further investigate the temporal gap between the socio-emotional and self-regulatory systems.

Lastly, the participants came from a relatively homogeneous sample. Thus, these results may not generalize to populations from other regions with greater ethnic diversity. For example, drinking may not be normative, and depressive symptoms may be reported differently, for individuals with cultural or religious backgrounds that are more prohibitive or that carry greater stigma for mental illness (Akvardar et al., 2003; Lauber & Rossler, 2007).

### **Conclusions and Implications for Future Research**

To the best of my knowledge, the present study is the first to assess the prevalence of co-occurrence and to investigate how differences in delay of gratification and approach behavior can predict group membership among a normative sample of adolescents categorized according to different levels of depressive symptoms and alcohol use. Individuals in the co-occurrence group were characterized by the lowest delay of

gratification, suggesting that lower self-regulation is associated with the reporting of both higher levels of depressive symptoms as well as alcohol use (e.g., Wang et al., 2012; Wills & Stoolmiller, 2002). In addition, the co-occurrence group had the lowest approach scores and the highest levels of at-risk background, suggesting that these individuals might be more socially withdrawn or isolated from their peers (Fleming et al., 2008; Lewinsohn et al., 2003), and imply that other external stress factors or risk behaviors (e.g., use of drugs before age 13) may be involved in the development of co-occurrence.

Overall, the findings of the present study suggest that assessment of delay of gratification and approach are useful in identifying youth at greater risk for co-occurring depressive symptoms and alcohol use, although less so for differentiating them from individuals high in only one behavior. If delay of gratification and approach can successfully predict group membership in a normative sample, it is possible that they may be even more crucial for high-risk or clinical samples. Furthermore, although approach was a significant predictor, it was delay of gratification that was the more robust and important predictor for discriminating among the groups. This is an important finding because practitioners may want to target or focus specifically on delay of gratification in the identification of problem behaviors. As adolescence may be a sensitive period for self-regulation (i.e., delay of gratification) and problem behaviors (i.e., depressive symptoms, alcohol use) according to the Dual Systems Theory, this age range may represent an optimal point in development during which interventions might be implemented (Kandel & Davies, 1982; Measelle et al., 2006; Steinberg, 2008, 2010).

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Table 1

*Means and standard deviations of study measures*

<i>Variable</i>	<i>Grade 9</i>		<i>Grade 10</i>		<i>Grade 11</i>		<i>Grade 12</i>	
	<i>Boys</i> <i>M (SD)</i>	<i>Girls</i> <i>M (SD)</i>						
Depressive Symptoms	1.80 (0.49)	1.98 (0.59)	1.87 (0.51)	2.09 (0.61)	2.02 (0.61)	2.10 (0.59)	2.08 (0.57)	2.14 (0.56)
Alcohol Use	1.79 (0.72)	1.81 (0.75)	2.51 (0.95)	2.26 (0.82)	2.97 (1.06)	2.62 (0.89)	3.24 (0.99)	2.80 (0.78)
At-Risk Background	0.49 (0.77)	0.45 (0.71)	N/A	N/A	N/A	N/A	N/A	N/A
Parental Education	3.29 (1.05)	3.21 (1.05)	N/A	N/A	N/A	N/A	N/A	N/A
Delay of Gratification	3.24 (0.61)	3.26 (0.67)	N/A	N/A	N/A	N/A	N/A	N/A
Approach	2.81 (0.52)	2.77 (0.54)	N/A	N/A	N/A	N/A	N/A	N/A

Note.  $N = 2244$  for boys; 2168 for girls. Higher scores indicate higher depressive symptoms, alcohol use, at-risk background, parental education, delay of gratification, and approach.

Table 2

*Correlations among variables for boys and girls*

Variable	1	2	3	4	5	6	7	8	9	10	11	12
<b>Grade 9</b>												
1. At-Risk	-	-.09***	-.08***	-.06**	.16***	.10***	.13***	.20***	.12***	.10***	.10***	.13***
2. ParEduc	-.17***	-	.13***	.07***	-.10***	-.10***	-.05*	-.10***	-.09***	-.04	-.02	-.02
3. Delay	-.08***	.12***	-	.05*	-.21***	-.17***	-.18***	-.21***	-.15***	-.14***	-.13***	-.13***
4. Approach	.04*	.07***	.06**	-	-.13***	-.08***	-.06**	-.05*	.03	-.01	.04	.05*
<b>Grades 9 - 12</b>												
5. Dep. 9	.14***	-.15***	-.38***	-.18***	-	.52***	.40***	.41***	.19***	.07***	.04	.01
6. Dep. 10	.14***	-.09***	-.24***	-.15***	.67***	-	.46***	.39***	.10***	.17***	.06**	.03
7. Dep. 11	.12***	-.16***	-.24***	-.13***	.55***	.60***	-	.44***	.10***	.10***	.12***	.04
8. Dep. 12	.17***	-.16***	-.26***	-.05*	.55***	.58***	.66***	-	.12***	.12***	.11***	.09***
9. Alc. 9	.17***	-.10***	-.27***	.01	.27***	.17***	.10***	.14***	-	.22***	.24***	.17***
10. Alc. 10	.11***	-.12***	-.28***	-.02	.22***	.20***	.14***	.15***	.30***	-	.39***	.27***
11. Alc. 11	.13***	-.11***	-.20***	.00	.14***	.13***	.13***	.09***	.29***	.49***	-	.39***
12. Alc. 12	.15***	-.10***	-.17***	.02	.07***	.06**	.07***	.07**	.23***	.31***	.43***	-

Note.  $N = 2244$  for boys; 2168 for girls. Boys = above the diagonal, girls = below the diagonal. At-Risk = at-risk background, ParEduc = Parent Education, Delay = Delay of Gratification. Higher scores indicate higher levels of each variable.  $P$  values = \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

Table 3

*Fit indices for growth mixture models*

LC		Depressive Symptoms		Alcohol Use		
		2	3	2	3	4
BIC	Boys	12492.870	12263.473	22504.204	22088.077	21587.448
	Girls	11722.611	11294.322	19132.375	18687.846	18102.222
Entropy	Boys	0.826	0.786	0.901	0.912	0.950
	Girls	0.842	0.844	0.899	0.932	0.959
Class > 5%	Boys	Yes	No	Yes	Yes	No
	Girls	Yes	No	Yes	Yes	Yes
LMR- LRT	Boys	Sig	NS	Sig	Sig	NS
	Girls	Sig	Sig	Sig	Sig	Sig

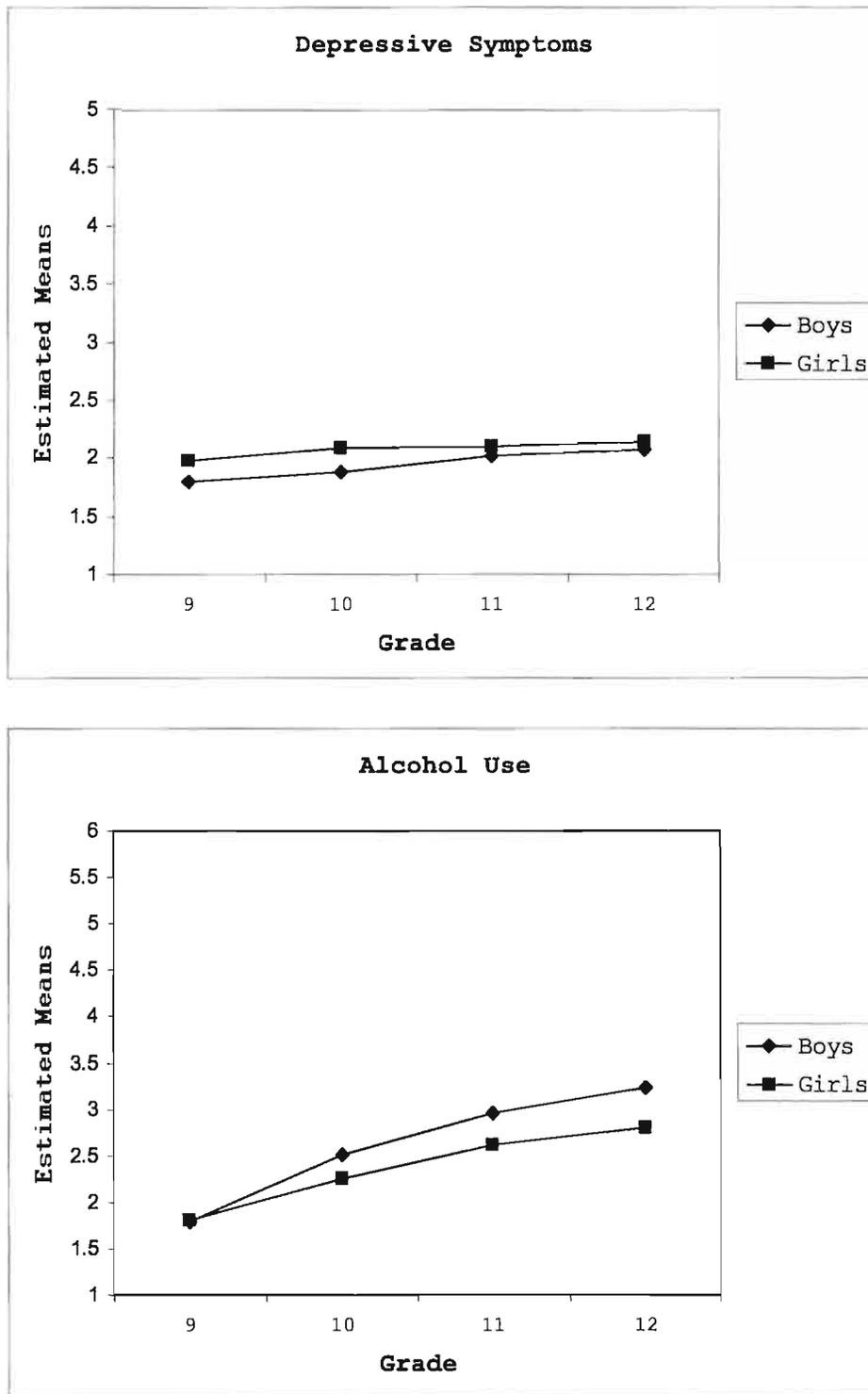
*Note.* LC = Latent Classes, BIC= Bayesian information criterion (smaller values indicate better model fit), Entropy (higher values indicates well identified classes), Class > 5% (any class smaller than 5% not sufficient), LMR-LRT = Lo-Mendell-Rubin Adjusted Likelihood Ratio Test (test of fit between the model of interest (e.g., three-class model) and the model with one less class (e.g., two-class model). Sig = significant. NS=non-significant.

Table 4

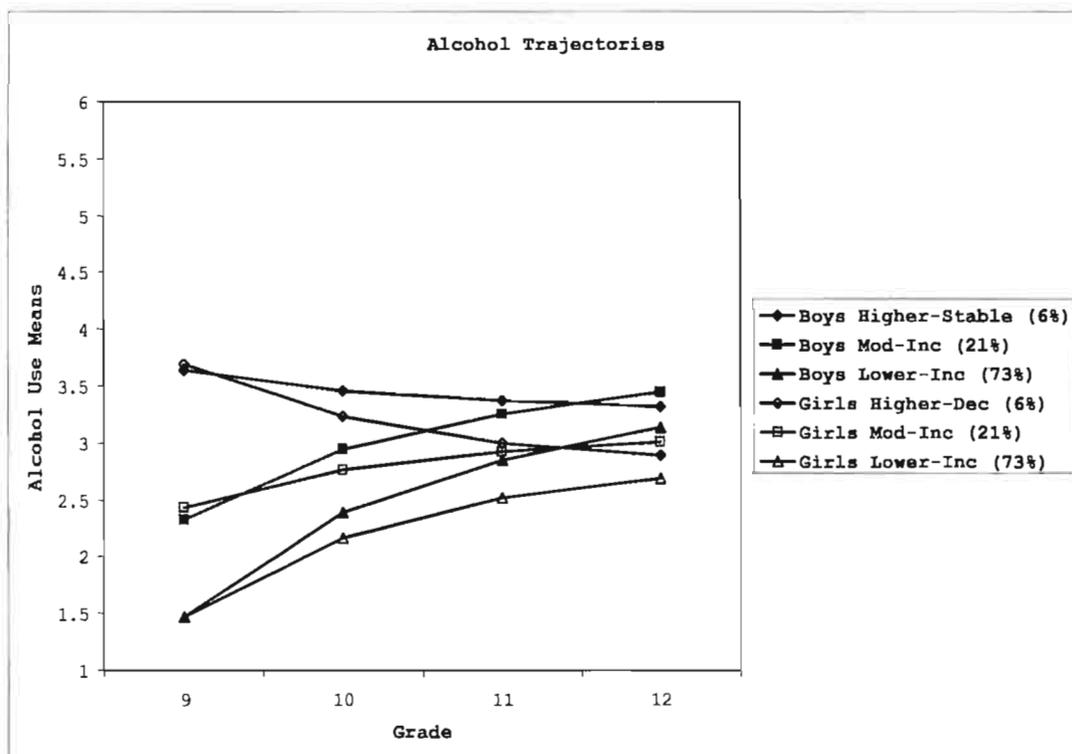
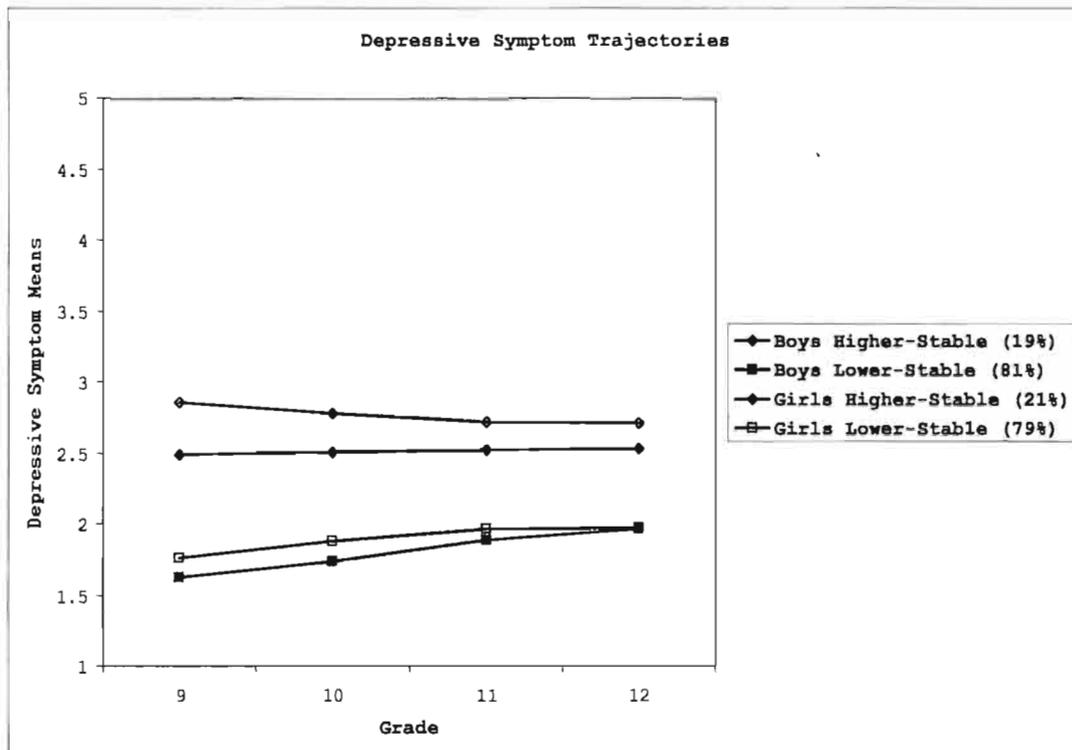
*Univariate and multivariate results for co-occurrence groups*

<i>Variables</i>	ANOVA								<i>DFA</i> <i>Function 1</i>		<i>DFA</i> <i>Function 2</i>	
	Co-Occurrence <i>M</i> (SD)		Pure DS <i>M</i> (SD)		Pure AU <i>M</i> (SD)		Low Co-Occurrence <i>M</i> (SD)		<i>SDFC</i>		<i>SDFC</i>	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
At-Risk Background	0.70 (0.88) <sup>a</sup>	0.66 (0.77) <sup>a</sup>	0.49 (0.78) <sup>b</sup>	0.47 (0.79) <sup>b</sup>	0.50 (0.64) <sup>b</sup>	0.53 (0.69) <sup>ab</sup>	0.47 (0.79) <sup>b</sup>	0.39 (0.68) <sup>b</sup>	-.199	-.254	NS	.313
Parental Education	3.20 (0.99) <sup>a</sup>	3.06 (1.13) <sup>a</sup>	3.32 (1.12) <sup>a</sup>	3.05 (1.07) <sup>a</sup>	3.21 (1.03) <sup>a</sup>	3.15 (0.98) <sup>ab</sup>	3.32 (1.05) <sup>a</sup>	3.28 (1.06) <sup>b</sup>	.024	.076	NS	.073
Delay Gratification	3.04 (0.70) <sup>a</sup>	2.70 (0.73) <sup>a</sup>	3.11 (0.64) <sup>a</sup>	3.06 (0.64) <sup>b</sup>	3.15 (0.55) <sup>a</sup>	3.13 (0.59) <sup>b</sup>	3.32 (0.59) <sup>b</sup>	3.42 (0.63) <sup>c</sup>	.863	.894	NS	-.212
Approach	2.68 (0.59) <sup>a</sup>	2.58 (0.57) <sup>a</sup>	2.74 (0.55) <sup>ab</sup>	2.61 (0.55) <sup>a</sup>	2.82 (0.55) <sup>b</sup>	2.84 (0.55) <sup>b</sup>	2.84 (0.49) <sup>b</sup>	2.79 (0.52) <sup>b</sup>	.392	.282	NS	.910

*Note.*  $N = 2244$  for boys; 2168 for girls. For each gender separately, means in the same row with different superscripts are significantly different at  $p < .013$ . Co-Occurrence = Higher Depressive Symptoms and Higher Alcohol Use, Pure DS = Pure Depressive Symptoms, Pure AU = Pure Alcohol Use, Low Co-Occurrence = Lower on DS and AU, DFA = Discriminant Function Analysis, and SDFC = standardized discriminant function coefficients.



*Figure 1.* Developmental trajectories of depressive symptoms and alcohol use. Means for depressive symptoms and alcohol use across 4 years of high school for boys ( $N = 2244$ ) and girls ( $N = 2168$ ). Scores are adjusted means.



*Figure 2.* Sub-group trajectories for depressive symptoms and alcohol use. Means for depressive symptoms and alcohol use across 4 years of high school for boys ( $N = 2244$ ) and girls ( $N = 2168$ ). Scores are adjusted means.

**APPENDIX A – SURVEY QUESTIONNAIRE****PART A** **Demographics**

1. How old are you?       13       14       15       16       17       18 or over
2. Are you male or female?    Male                       Female
3. Were you born in Canada?  Yes       No → If No, how long have you been in living in Canada? \_\_\_\_\_
4. What is the highest level of education your MOTHER/STEPMOTHER (female guardian) completed?
  - Did not finish high school
  - Finished high school
  - Some college, university, or apprenticeship program
  - Completed a college/apprenticeship diploma (e.g., electrician) and/or technical diploma (i.e. graphic design, hair dressing)
  - Completed a university undergraduate degree
  - Completed a professional degree (e.g., masters, PhD, medical doctor, lawyer)
  - Still going to school
  - Don't know
5. What is the highest level of education your FATHER/stepfather (male guardian) completed?
  - Did not finish high school
  - Finished high school
  - Some college, university, or apprenticeship program
  - Completed a college/apprenticeship diploma (e.g., electrician) and/or technical diploma (i.e. graphic design, hair dressing)
  - Completed a university undergraduate degree
  - Completed a professional degree (e.g., masters, PhD, medical doctor, lawyer)
  - Still going to school
  - Don't know

**PART B**

**Depression**

Fill in the answer that best describes how often you felt or behaved this way DURING THE PAST TWO WEEKS.

	NONE OF THE TIME (LESS THAN 1 DAY)	RARELY (1-2 DAYS)	SOME OF THE TIME (3-5 DAYS)	OCCASIONALLY (6-9 DAYS)	MOST OF THE TIME (10-14 DAYS)
1. I was happy.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
2. I did not feel like eating; my appetite was poor.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
3. I felt that I could not stop feeling sad, even with help from my family and friends.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
4. I felt that I was just as good as other people.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
5. I had trouble keeping my mind on what I was doing.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
6. I felt depressed.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
7. I felt that everything I did was an extra effort.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
8. I felt hopeful about the future.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
9. I thought my life had been a failure.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
10. I felt fearful.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
11. My sleep was restless.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
12. I was bothered by things that usually don't bother me.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
13. I talked less than usual.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
14. I felt lonely.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
15. People were unfriendly.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
16. I felt like doing nothing.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
17. I had crying spells.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
18. I felt sad.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
19. I felt that people disliked me.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
20. I enjoyed life.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....

**PART C**

**Alcohol Use**

Fill in the circle that best describes you.

1. How often do you go drinking or have a drink?

- Never                       less than once a month       1-3 times a month                       Once a week  
 2 times a week               3-4 times a week                       5-6 times a week                       Every day

2. On average, when you are drinking alcohol, about how many drinks do you have?

- Less than 1 drink                       1 drink                       2-3 drinks  
 4-6 drinks                       7-10 drinks                       Over 10 drinks

**PART D** **At Risk Factors**  
Please tell us if any of these things have happened in your life.

1. **Are your parents separated or divorced?**  
 Yes  No
2. **Did either of your parents or guardians drink or use drugs so often that it caused problems for your family?**  
 Yes  No
3. To assess whether the participant started using marijuana prior to age 13, asked:
  - a. **Have you EVER tried marijuana (weed, joint), even one or two puffs?**  
 Yes  No
  - b. **If yes, how old were you when you tried marijuana for the first time?**  
 8 years or younger  9 or 10  11 or 12  13 or 14  15 or 16  17 or older
4. To assess whether participant had a teen mother, asked:
  - a. **How old is (or would be) your birth mother right now?**  
 22-27  28-33  34-39  40-45  Over 45  Don't know
  - b. **How old are you?**  
 13  14  15  16  17  18 or over
5. **Have you been diagnosed with any learning disabilities (e.g., Attention-Deficit-Hyperactivity Disorder, Central Auditory Processing, etc.)?**  
 Yes  No
6. **Are you living, or have you ever lived, in foster care?**  
 Yes  No

**PART E** **Delay of Gratification**  
Here are some things that people may say about themselves. Fill in the answer that you think is true for you.

	NEVER	A LITTLE	SOMETIMES	PRETTY OFTEN	USUALLY
1. When I really want something, I cannot keep my mind off it.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
2. I have difficulty saving money to buy something several weeks later.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
3. It's difficult for me when I have to wait my turn for a long time.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
4. I usually do what I want when I want to, I don't think about what it will mean to me later.....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....
5. I feel that having a good time now is more important than thinking about what might happen "sometime.".....	.....○.....	.....○.....	.....○.....	.....○.....	.....○.....

**PART F** **Approach/Withdrawal**  
Fill in the circle that best describes you.

	ALMOST ALWAYS OR ALWAYS	OFTEN	SOMETIMES	ALMOST NEVER OR NEVER
1. I can make myself at home anywhere.....	.....○.....	.....○.....	.....○.....	.....○.....
2. I am interested in new objects shown to me.....	.....○.....	.....○.....	.....○.....	.....○.....
3. I like trying new things.....	.....○.....	.....○.....	.....○.....	.....○.....
4. My first response to anything new is to be interested in it.....	.....○.....	.....○.....	.....○.....	.....○.....
5. I like meeting new people.....	.....○.....	.....○.....	.....○.....	.....○.....

## APPENDIX B – ETHICS FORM



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**Brock University**

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**Senate Research Ethics Board**  
3205/4315, Room C315

**Extensions**

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**FROM:** David Butz, Chair  
Senate Research Ethics Board (REB)

**TO:** Teena Willoughby, Child and Youth Studies

**FILE: 00-116, WILLOUGHBY**

The Brock University Research Ethics Board has reviewed the revised research proposal:

“Enhancement of youth resiliency and reduction of  
harmful behaviours leading to healthy lifestyle choices”

The Research Ethics Board finds that your revised proposal conforms to the Brock University guidelines set out for ethical research.

**\* Accepted as clarified**

Please note: Any Changes or Modifications to this approved research must be reviewed and approved by the committee. If so, please complete form #5 - *Request for Ethics Clearance of a Revision or Modification to an Ongoing application for Ethics Review of Research with Human Participants* and submit it to the Chair of the Research Ethics Board. You can download this form from the Office of Research Services or visit the web site:

<http://www.BrockU.CA/researchservices/mainethicsformpage.html>

DB/dvo

## APPENDIX C – PARENT INFORMATION LETTER

Parent/Guardian:

Since January 2000, the Niagara Catholic District School Board has been an active member of the Youth Lifestyle Choices – Community University Research Alliance (YLC–CURA), which consists of 31 community agencies and 15 faculty at Brock University. Our goal is to better understand youth lifestyle choices, both those involving risk and those that are positive. In order to do this, we are following youth in Niagara as they continue through adolescence. We believe that if we can gain an understanding of these choices and of the protective factors that youth will need in life, we can begin to develop more effective ways to enhance their coping skills and enable youth to make positive lifestyle choices.

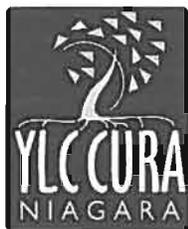
In 2003 and 2004, YLC-CURA surveyed over 7,000 youth in the Niagara Region, and may have included your child in the study. The information gathered has been published in many reports, and used by multiple community agencies in Niagara to improve their programming and to apply for more government funding. This information is also being used to enhance curriculum with relevant statistics that reflect Niagara youth lifestyles. With continued research, we will be in a unique position to explore the pathways students take as they progress through adolescence. We are writing to ask your permission for your child to participate in completing the survey again. The survey will take approximately 45 minutes to complete. Completing the survey again is critical in order to examine how youth change in their perceptions as they go through adolescence. Your child will be asked to answer a number of questions about lifestyle choices and experiences (e.g., questions involving computer use, aggression, victimization, school culture, substance use, daily hassles, family lifestyle, depression, anxiety, friendship quality, etc.). A copy of the questionnaire is available in the school office. This information will allow us to understand how youth make decisions about lifestyle choices and how transition periods, such as entry to the secondary school system, affect those decisions.

This project has received ethics clearance from the Brock University Committee on Research with Human Participants, and the Niagara Catholic District School Board, and is funded by the Social Sciences and Humanities Research Council of Canada. The project will be implemented during the Teacher Advisory Group (TAG). The content of the questions address issues found in provincial curriculum. The questionnaire acts as an educational and discussion tool for teachers, students, and parents.

All of the information that we record will be kept completely confidential. Only group data will be reported. This group data may eventually be housed in an archive, again with no identifying information. You and your child will be free to withdraw your participation at any time without penalty. More specifically, non-participation will not affect your child's grades in any way. Students who do not wish to complete the survey will complete an alternative educational task.

We hope that you and your child will be willing to participate in our project and we look forward to sharing our findings with you at the end of this project. We have attached a consent form for you to let us know if you wish your child to participate in this project. **ONLY** return the form if you do **NOT** wish your child to participate. If you do **NOT** want your child to participate please sign and return the attached form to the Student Services Department in your child's school **by April 7, 2006**. We also will ask your child to provide assent to participating in the study.

If you have any questions or concerns about your participation in the study, you may contact Michael Busseri at 905-688-5550, ext. 4798 (or by email at [cura@www.brocku.ca](mailto:cura@www.brocku.ca)), or the Research Ethics Officer at 905-688-5550, Ext. 3035. For more information, you can access our website [www.brocku.ca/cura](http://www.brocku.ca/cura). Thank you for considering our project.



### Youth Lifestyle Choices Community University Research Alliance

The YLC-CURA is a long-term strategic partnership between a number of Brock University faculty & Niagara Region Community agencies to better understand resilience and youth lifestyle choices.

#### Member Organizations

- ◆ Adolescent's Family Support Services of Niagara
- ◆ Boys and Girls Club of Niagara
- ◆ Brock University
- ◆ Business Education Council of Niagara
- ◆ Canadian Red Cross
- ◆ Centre for Addiction & Mental Health
- ◆ City of St. Catharines
- ◆ City of Welland
- ◆ Centre De Santa Communautaire
- ◆ Contact Niagara
- ◆ District School Board of Niagara
- ◆ Early Childhood Community Development Centre
- ◆ Family & Children's Services/Family Counselling Centre
- ◆ GLBTQ Outreach Project of Niagara
- ◆ Institute for Enterprise Education
- ◆ Lighthouse Niagara
- ◆ Ministry of Corrections Probation and Parole Services
- ◆ Niagara Alcohol & Drug Assessment Service
- ◆ Niagara Catholic District School Board
- ◆ Niagara Centre for Youth Care
- ◆ Niagara District Health Council
- ◆ Niagara Regional Police
- ◆ Operation Springboard
- ◆ Port-Colborne/ Wainfleet Healthy Lifestyles Coalition
- ◆ Regional Municipality of Niagara-Community Services Children's Services Division
- ◆ Regional Niagara Public Health Department
- ◆ St. Catharines Chamber of Commerce
- ◆ St. Catharines Public Library
- ◆ The Raft
- ◆ YMCA
- ◆ YWCA of St. Catharines

The YLC-CURA is a core partner on a Health Canada Centre of Excellence for Youth Engagement  
Contact Information  
YLC-CURA

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St. Catharines, ON  
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Web: [www.ylc-cura.ca](http://www.ylc-cura.ca)

YLC-CURA is a  
Social Sciences & Humanities  
Research Council of Canada  
funded project.

## APPENDIX D – PARENT CONSENT FORM

### Youth Lifestyle Choices: Community University Research Alliance BROCK UNIVERSITY - YOUTH RESILIENCE QUESTIONNAIRE

I understand that this research study in which I have agreed to allow my child to participate is designed to better understand factors that foster healthy lifestyle choices in adolescence. I understand that this study also will identify where gaps may exist in services available to youth in the Niagara Region, and as such, will be of benefit to my child. This study is being conducted by the YLC-CURA (Professor Willoughby, email address [twilloug@brocku.ca](mailto:twilloug@brocku.ca), 905-688-5550, ext. 4281).

- I understand that my child will be asked to answer a number of questions about lifestyle choices and experiences (e.g., questions involving computer use, aggression, victimization, school culture, substance use, daily hassles, family lifestyle, anxiety, friendship quality, etc.).
- I understand that a copy of the questionnaire is available for inspection in the school office. The questionnaire will take approximately 45 minutes to complete. Students who do not have parental permission or who choose not to complete the questionnaire will have 45 minutes to complete an alternative educational activity.
- I understand that my child's questionnaire may be matched to previous year's questionnaires as part of this long-term study.
- I understand that my child's participation in this study is voluntary and that my child or I may withdraw from the study at any time and for any reason without penalty.
- I understand that there is no obligation for my child to answer any question in the questionnaire that they consider invasive or inappropriate.
- I understand that there are very minimal potential risks to my child to participate in this study. Based on the YLC-CURA's experience with youth filling in similar surveys in 2001, 2003, and 2004, I understand that my child is not anticipated to experience any negative feelings about the survey. In case he or she has questions or concerns, however, I understand that the YLC-CURA research staff will be available in the classroom to answer questions and will provide all students with a bookmark that includes phone numbers of youth-serving agencies in Niagara. I understand that all data will be kept completely confidential, except in the rare instance where a child indicates that they may be in danger of being abused.
- I understand that only group data will be reported and no information about individual responses will ever be given to schools, teachers, or anyone else. I understand that I will not have access to my child's responses. The data, with identifying information removed, will be retained indefinitely and will be securely stored in a locked office in the research laboratory. Group data only may be published, presented at conferences, used to evaluate programs, or used for secondary data analyses by other researchers. Feedback and information about the results of this study will be posted on the YLC-CURA website ([www.brocku.ca/cura](http://www.brocku.ca/cura)).
- I understand that my child will be asked if they would like to participate again in the study several years after they graduate so that we can understand more about the ways in which young people change and stay the same as they get older. I understand that my child will be asked if they would be willing to provide their email address, if applicable, so that we can contact them later. I understand that their email address will be kept strictly confidential in a locked cabinet in our lab - no researcher other than the primary researcher will have access to that information. I understand my child's email address only will be used to initiate contact but that my child will have to give permission before being asked to answer any survey questions.
- This project has been reviewed by, and received ethics clearance through, the Office of Research Ethics Board. (File #00-116)

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**Please return this form to the Student Services Department of your child's school by April 7, 2006, ONLY if you do NOT want your child to participate.**

Child's name (first and last) \_\_\_\_\_

Child's Birthdate \_\_\_\_\_

Parent/Guardian Signature \_\_\_\_\_

Date \_\_\_\_\_

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If you have any questions or concerns about your participation in the study, you may contact Michael Busseri at 905-688-5550, ext. 4798 (or by email at [cura@www.brocku.ca](mailto:cura@www.brocku.ca)), or the Research Ethics Officer at 905-688-5550, Ext. 3035. We also have a website, [www.brocku.ca/cura](http://www.brocku.ca/cura) that you can access for more information. Please keep a copy of this form for your records.

## APPENDIX E - PARTICIPANT ASSENT FORM

### Youth Lifestyle Choices - Community University Research Alliance (YLC-CURA) Brock University - Youth Resilience Questionnaire

I understand that I am agreeing to participate in this study which will involve answering a series of questions concerning lifestyle choices and experiences. I understand that this study also will identify where gaps may exist in services available to youth in the Niagara Region, and as such, will be of benefit to me. This study is being conducted by the YLC-CURA (email at cura@www.brocku.ca).

- I understand that I will be asked to answer a number of questions about lifestyle choices and experiences (e.g., questions involving computer use, aggression, victimization, school culture, substance use, daily hassles, family lifestyle, anxiety, friendship quality, etc.).
- I understand that my participation in this study is voluntary and that I may withdraw from the study at any time and for any reason without penalty. I understand that the questionnaire will take about 45 minutes to complete. Students who choose not to complete the questionnaire will have 45 minutes to complete an alternative educational activity.
- I understand that my responses to the questionnaire may be matched to previous year's questionnaires as part of this long-term study.
- I understand that there is no obligation to answer any question in the questionnaire that I consider invasive or inappropriate.
- I understand that my parents or guardians have been informed about the study and have consented to my participation, although this does not mean that I must participate.
- I understand that only the YLC-CURA researchers will have access to the data. I understand that all data will be kept confidential except in the case where I provide information that indicates that I am in danger of being abused.
- I understand that there are very minimal potential risks to my participation in this study. Based on the YLC-CURA's experience with youth filling in similar surveys in 2001, 2003, and 2004, I understand that I am not expected to experience any negative feelings about the survey. In case I have questions or concerns, however, I understand that the YLC-CURA research staff will be available in the classroom to answer questions and will provide all students with a bookmark that includes phone numbers of youth-serving agencies in the Niagara Region.
- I understand that only group data will be reported and no information about individual responses will ever be given to schools, teachers, or anyone else. The data, with identifying information removed, will be retained indefinitely and will be securely stored in a locked office in the research laboratory. Group data only may be published, presented at conferences, used to evaluate programs, or used for secondary data analyses by other researchers. Feedback and information about the results of this study will be posted on the YLC-CURA website (www.brocku.ca/cura) in September 2006.
- One of the most valuable parts of our research is that we are able to describe the ways in which young people change and stay the same as they get older. We know that the time between high school and young adulthood is a very unique time of life and we think that it is important to find out more about it. In order to see how people develop, we need to have future information from the same people who gave us information during high school - thus, no one can take your place in this study! We would like to ask you about your experiences again after you graduate, as well as provide you with ongoing feedback about the results of our study.
- If you would be willing for us to contact you in a year or two, please provide us with your email address \_\_\_\_\_.
- Email addresses only will be used to send you information about the results of our study and to ask whether you would be interested in being part of our study in the future. Your email address will be kept strictly confidential in a locked cabinet in our lab and no researcher other than the primary researcher will have access to that information.

Participant Signature \_\_\_\_\_ Date \_\_\_\_\_

This study has been reviewed and approved by the Brock Research Ethics Board (File # 00-116). If you have any questions or concerns about your participation in this study, you may contact Michael Busseri at 905-688-5550, ext. 4798 (or by email at cura@www.brocku.ca), or the Research Ethics Officer at 905-688-5550, Ext. 3035. We also have a website, www.brocku.ca/cura, that you can access for more information. Please keep a copy of this form for your records.

Teena Willoughby, Ph.D.

Professor, twilloug@brocku.ca

905-688-5550, ext. 4281