FEATURE ARTICLE

Multiple Health-Risk Behaviour and Psychological Distress in Adolescence

Kelly P. Arbour-Nicitopoulos PhD[1]; Guy E. Faulkner PhD[1] ; Hyacinth M. Irving MA[2]

Abstract

Objective: To examine the prevalence and correlates of psychological distress in a school-based sample of Canadian adolescents. **Method:** Self-reported data of demographics, weight status, physical activity, screen-time, diet, substance use, and psychological distress were derived from a representative sample of 2935 students in grades 9 to 12 (M_{age} = 15.9 years) from the 2009 Ontario Student Drug Use and Health Survey. **Results:** Overall prevalence of psychological distress was 35.1%. Significant associations were shown between psychological distress and the following: being female, tobacco use, not meeting physical activity and screen-time recommendations, and inadequate consumption of breakfast and vegetables. **Conclusions:** These findings highlight the need for targeting greater physical health promotion for adolescents at risk of mental health problems.

***Key words**: adolescents, multiple health behaviour, mental health*

Résumé

Objectif: Examiner la prévalence de la détresse psychologique et ses corrélats dans un échantillon scolaire d'adolescents canadiens et. **Méthodologie:** Les données démographiques auto-déclarées sur le poids, l'activité physique, le temps d'écran, l'alimentation, la consommation de drogue, et la détresse psychologique sont celles de 2935 élèves de 9e à 12e année (âge moyen = 15,9 ans) qui ont répondu au Sondage sur la consommation de drogues et la santé des élèves de l'Ontario (SCDSEO) de 2009. **Résultats:** La prévalence générale de la détresse psychologique était de 35,1%. La détresse psychologique était significativement associée aux caractéristiques suivantes: être de sexe féminin, fumer du tabac, ne pas respecter les consignes relatives à l'éducation physique et au temps d'écran, ne pas prendre un déjeuner équilibré et consommer peu de légumes. **Conclusion:** Il est nécessaire d'encourager une plus grande activité physique chez les adolescents à risque de maladie mentale.

***Mots clés:** adolescents, facteurs comportementaux multiples liés à la santé, santé mentale*

Abbreviations used in this article

GHQ	General Health Questionnaire
IOF	International Obesity Task Force
OSDUHS	Ontario Student Drug Use and Health Survey
PA	physical activity
SMI	severe mental illness
WHO	World Health Organization

Adolescent mental health is a concern in Canada, with approximately 5% of male youth and 12% of female youth aged 12-19 years having experienced at least one major depressive episode (Canadian Mental Health Association, 2010). Medications that are used to treat mental illness are often associated with weight gain (Allison et al., 2009), and therefore may contribute to the increased risk of being overweight or obese in later life. A recent review found longitudinal-based evidence suggesting a 1.90- to 3.50-fold increased risk of being overweight in later life for childhood and adolescent depressive symptoms (Liem, Sauer, Oldehinkel, & Stolk, 2008). In younger populations who are not undergoing medical treatment, other modifiable health-risk behaviours, such as smoking and physical inactivity, may contribute to the increased risk of being overweight or obese in later life (Centers for Diseases Control and Prevention, 2005). These health-risk behaviours often begin during adolescence and extend into adulthood, and

[1]Faculty of Kinesiology and Physical Education, University of Toronto, Ontario

[2]Centre for Addiction and Mental Health, Toronto, Ontario

Corresponding email: kelly.arbour@utoronto.ca

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have been postulated to have negative implications on long-term health (Centers for Diseases Control and Prevention, 2005).

The relationship between mental health and health-risk behaviours is well-recognized in the adult population who suffer from severe mental illness (SMI), such as major depression and schizophrenia (Allison et al., 2009). Rates of obesity, substance abuse, and physical inactivity are disproportionately higher in persons with SMI than in the general population (Allison et al., 2009; Jerome et al., 2009; Kalman, Morissette, & George, 2005). Poor nutrition is also a concern. Compared to the general population, individuals diagnosed with SMI often consume fewer daily servings of fruits, vegetables, and fiber, skip breakfast more frequently, and consume more sugar and fat (Brown, Birtwistle, Roe, & Thompson, 1999). Among adolescents, skipping breakfast, inadequate consumption of fruits and vegetables, and daily consumption of sugar-sweetened beverages are related to higher weight status (Deshmukh-Taskar et al., 2010; Malik, Schulze, & Hu, 2006). However, our understanding of the relationship between adolescent mental health and health-risk behaviours is limited (e.g., Brooks, Harris, Thrall, & Woods, 2002; Katon et al., 2010; Mistry, McCarthy, Yancey, Lu, & Patel, 2009; Paxton, Valois, Watkins, Huebner, & Wazner Drane, 2007). Previous studies have found that adolescents with depressive symptoms are more likely to smoke, use alcohol and drugs, exhibit unhealthy diets, spend more time in sedentary behaviour, and have a higher prevalence of obesity (Brooks et al., 2002; Katon et al., 2010; Paxton et al., 2007). This link is particularly evident among female adolescents (Mistry et al., 2009). More research is needed to establish the relationship between adolescent mental health and modifiable health-risk behaviours.

One model that may be useful for understanding the relationship between adolescent mental health and health-risk behaviours is the multiple affective behaviour change (M-ABC) model (Taylor, 2010). According to this model, a reciprocal relationship exists between mood and the engagement in mood-regulating behaviours (i.e., substance use, high energy snacking, and sedentary behaviour). Specifically, during temporary or more prolonged periods of negative mood and stress there may be a greater tendency to engage in health behaviours that may enhance mood and affect. Some individuals may use alcohol or nicotine to regulate their mood; others may engage in brief bouts of physical activity. These mood-regulating behaviours, in turn, have a direct influence on weight status. The M-ABC model provides a framework for designing multiple health behaviour change interventions as well as for identifying potential moderators of the relationship between mood and multiple health behaviours. Additionally, the M-ABC model provides researchers with the opportunity to examine any moderators of the relationships between mood, multiple health behaviours, and obesity. However, prior to rigorous model testing, more research is needed to determine whether the relationships identified in the M-ABC model can be applied to adolescents.

The current study extends the previous research on adolescent mental health and health-risk behaviours by providing a Canadian examination of adolescent mental health symptoms, specifically psychological distress, and health-risk behaviours using a conceptual framework (i.e., the M-ABC model; Taylor, 2010). Furthermore, this study extends current research by examining a broader range of dietary behaviours in the context of adolescent mental health and health-risk behaviours. For example, skipping breakfast has been associated with less favorable nutrient intake profiles and greater adiposity in adolescence (Deshmukh-Taskar et al., 2010), while associations are also commonly found between greater intakes of sugar-sweetened beverages and weight gain and obesity (Malik et al., 2006). It was hypothesized that psychological distress would be associated with female sex, low parental education, overweight/obesity, older age, physical inactivity, screen-time behaviour, use of alcohol, tobacco, and cannabis, irregular consumption of breakfast, fruits and vegetables, and daily consumption of soft drinks. Identifying modifiable predictors of overweight and obesity in adolescence could lead to more effective targeted prevention strategies, and therefore, a decreased likelihood of developing physical and mental illness later in life (Liem et al., 2008).

Method

Study Design

Data were derived from the 2009 cycle of the Ontario Student Drug Use and Health Survey (OSDUHS; Centre for Addiction and Mental Health, 2009). OSDUHS is a school-based study that has been conducted biennially since 1977 by the Centre for Addiction and Mental Health to assess the prevalence of self-reported health-risk behaviours among youth in Ontario, Canada. In the present study, data were extracted for students in the 9th through 12th grades. Written informed consent was obtained from parents/guardians and consent/assent was obtained from students prior to participating in the survey. Ethics approval was obtained from the Research Ethics Boards of the Centre for Addiction and Mental Health, York University, and the school boards. Further methodological details are available at http:www.camh.net/research/osdus.html.

Sample

The 2009 survey included 9,241 students from 47 school boards of education and 181 schools. The school and student response rates were 70% and 65%, respectively. Reasons for students' non-response included absenteeism (13%) and lack of active parental consent (22%). Study

participants were the random half sample of the 3,055 students schools who completed Form A of the questionnaire (Form B did not include a measure of psychological distress). The analytic sample comprised the 2,935 students (96.1%) for whom there were no missing data on measures included in the present study.

Measures

Psychological distress. The 12-item General Health Questionnaire (GHQ; Goldberg & William, 1988) is a validated instrument that was used to identify current depressed mood, anxiety, and problems with social functioning. It has been strongly associated with various psychological disorders such as depression and anxiety (Goldberg et al., 1997). The 12 items asked about various aspects of psychological distress (e.g., losing sleep over worry) experienced over the past few weeks. Each item had four response categories: "not at all," "no more than usual," "somewhat more than usual," and "much more than usual." The "GHQ method" (0-0-1-1; Goldberg et al., 1997) was used whereby the two least symptomatic answers were scored as "0" and the two most symptomatic answers were scored as "1". Items were summed and scores ranged from 0 to 12. As further suggested (Goldberg, Oldehinkel, & Ormel, 1998), the mean GHQ-12 score was used as an indicator for the best threshold (e.g., Allison et al., 2005). Based on the mean GHQ-12 score of 2.4 for the current study sample, the cut-off point 2/3 was used. A score of ≥ 3 was used to define psychological distress (coded 1), while a score of ≤ 2 indicated no psychological distress (coded 0). A recent study (Mann et al., 2011) has demonstrated evidence of specificity (0.71) and sensitivity (0.76) at a threshold value of 3 on the GHQ instrument.

Weight status. Body mass index was calculated as weight divided by height (kg/m^2). For the current analysis, "*overweight*" includes both the overweight and obese categories (coded 1), and "*not overweight*" includes both the normal and underweight categories (coded 0). Students ≤ 19 years of age were classified as being overweight or not overweight using the International Obesity Task Force age- and sex-specific cut-off points (Cole, Bellizzi, Flegal, & Dietz, 2000). Students > 19 years of age were classified as being overweight or not overweight based on the International Classification of adult weight status (World Health Organization, 2006).

Physical activity. Physical activity (PA) was assessed with the question, "On how many of the last 7 days were you physically active for a total of ≥ 60 minutes each day?" Participants were instructed to add up all of the time spent in any kind of physical activity that increased their heart rate and made them breathe hard some of the time (e.g., brisk walking, running, swimming). Response options ranged from "0" to "7" days. Students not meeting the current Canadian PA recommendations (Canadian Society of Exercise Physiology, 2011a) of ≥ 60 minutes per day of moderate PA on five or more days a week (coded 1) were compared to those meeting the PA guidelines (coded 0).

Screen-time. Screen-time was measured with the question, "In the last 7 days, about how many hours a day, on average, did you spend: watching TV/movies, playing video/computer games, on a computer chatting, emailing, or surfing the Internet?" Response options were "none," "≤1 hour a day," "1-2 hours a day," "3-4 hours a day," "5-6 hours a day," and "≥ 7 hours a day." Students not meeting the current Canadian screen-time guidelines (Canadian Society of Exercise Physiology, 2011b) of ≤ 2 hours per day (coded 1) were compared to those meeting the screen-time guidelines (coded 0).

Dietary behaviours. Students were asked how often, in the last 7 days, they consumed fruits, vegetables, and soft drinks. Response options for each item were as follows, "1 time," "2-4 times," "5-6 times," "Once each day," "More than once each day," and "Did not consume in the last 7 days." Responses were then dichotomized: students who consumed fruits or vegetables ≤ twice daily were coded as having inadequate consumption patterns (coded 1) and compared to those students who consumed fruits and vegetables > twice daily (coded 0). Students who reported consuming soft drinks daily (coded 1) were compared to those who did not (coded 0). Breakfast consumption was measured with the question, "On how many of the last five school days did you eat breakfast (more than a glass of milk or fruit juice), either at home, on the way to school, or at school before classes? Response categories were, "none," "1-2 days," "3-4 days," and "all 5 days." Regular breakfast consumers were those students who engaged in the behaviour all five days (coded 0) and irregular breakfast consumers were those who engaged in the behaviour less frequently (coded 1).

Substance use. Students were asked about their use of alcohol, tobacco, and cannabis with the following three questions: "In the last 12 months, how often did you drink alcohol (liquor, wine, beer, coolers)?", "In the last 12 months, how often did you smoke cigarettes?", and "In the last 12 months, how often did you use cannabis (e.g., "marijuana")?" Responses were then binary coded indicating use at least once (coded 1) versus nonuse (coded 0) during the 12 months preceding the survey.

Sociodemographic characteristics. Sociodemographics included sex (coded "1" for girls and "0" for boys), age (measured in years), and social class. Parental education was used as a proxy for social class. Students were asked to indicate each parent's highest level of education from among seven options: "did not attend high school" (coded 8 years); "attended high school" (coded 10 years); "graduated

high school" (coded 12 years), "attended college" (coded 13 years); "graduated college" (coded 14 years); "attended university" (coded 15 years), and "graduated university" (coded 16 years). Parental education was coded as the higher available response if the mother's and father's education levels differed, or if the student provided information for only one parent. Consistent with previous work (Miller, Barnes, Melnick, Sabo, & Farrell, 2002), cases where neither parent's education was available (n = 178) were recoded to the sample mean (14.4 years).

Statistical Analysis

Descriptive statistics including frequencies, means and standard deviations (SD) were used to characterize the sample. Logistic regression was used to examine the association between psychological distress and sociodemographics, PA, weight status, screen-time, dietary behaviours, and substance use. Odds ratios (OR) and their associated 95% confidence intervals (CI) were calculated. All statistical analyses were completed using Stata 11.0 (Stata Statistical Software, 2009), and used Taylor series methods to account for the complex sampling design of the 2009 OSDUHS. Statistical significance was set at $p \leq 0.05$.

Results

Sample Characteristics

Table 1 presents the descriptive characteristics of the sample. Of the 2935 students, 49.0% were girls and ranged in age from 13 to 20 years (M =15.9 years, SD = 1.4). About 23% of students were enrolled in grade 9, 23.5% in grade 10, 22.9% in grade 11, and 30.8% in grade 12. Mean parental education was 14.4 years (SD = 1.8). Students with psychological distress represented 35.1% of the study sample.

Correlates of Psychological Distress

Table 2 displays the results (ORs and 95% CIs) of the logistic regression analysis that examined the correlates of psychological distress. Of the sociodemographic characteristics, only sex was significantly associated with psychological distress (OR = 2.25, 95% CI = 1.90 to 2.66, $p < 0.001$), with girls approximately two times more likely than boys to have experienced psychological distress. Age, parental education, and weight status were not significantly associated with psychological distress. Both PA behaviour and screen-time were significantly associated with psychological distress. Students not meeting the PA (ORs = 1.38, 95% CI = 1.17 to 1.63, p values < 0.001) and screen-time (ORs = 1.37, 95% CI = 1.16 to 1.62, $p < 0.001$) recommendations were at an increased risk for psychological distress. In terms of the dietary behaviours assessed, students reporting irregular breakfast consumption (OR = 1.45, 95% CI = 1.23 to 1.71, $p < 0.001$) and inadequate vegetable consumption (OR = 1.27, 95% CI = 1.03 to 1.57, $p = 0.03$) were at a greater risk for psychological distress than those students reporting regular breakfast consumption and adequate vegetable consumption. Consumption of fruits and soft drinks were not significantly associated with psychological distress. Finally, with respect to substance use behaviours, tobacco use (OR = 1.52, 95% CI = 1.19 to 1.94, $p < 0.001$) was significantly associated with risk of psychological distress, while cannabis and alcohol use were not.

Discussion

Overall, 35.1% of the current Canadian adolescent sample reported being psychologically distressed. This prevalence is similar to rates previously reported in past OSDUHS reports (e.g., 31%; Centre for Addiction and Mental Health, 2007), as well as in previous US research examining adolescent depressive symptoms (e.g., 35%; Brooks et al., 2002). Although the GHQ-12 cut-off of ≥ 3 that was used to determine psychological distress is not diagnostic for mental illness, it is useful for identifying symptoms that are associated with various psychological disorders (e.g., depressed mood, anxiety; Goldberg et al., 1997; Mann et al., 2011). Our findings suggest that psychological distress is a concern among Canadian adolescents. If not attended to, these mental health problems may reappear later in adulthood (Lynam, Caspi, Moffitt, Loeber, & Stouthamer-Loeber, 2007). Positive mental health must be integrated within broader health-promoting initiatives. Creating a supportive environment that is conducive to learning (Rowling, 2007), and promoting a sense of connectedness (Faulkner, Adlaf, Irving, Allison, & Dwyer, 2009) may be the basis for such efforts.

Consistent with previous research in US adolescents, female sex, physical inactivity, high screen-time, and tobacco use were all significant correlates of psychological distress in Canadian adolescents. Similar to Paxton et al.'s (2007) findings for depressed mood, girls were over twice as likely to report psychological distress in comparison to boys. Meanwhile, students who engaged in more sedentary behaviours or who used tobacco were 50% more likely to report psychological distress. Extending previous research, and consistent with research in adults diagnosed with SMI (Brown et al., 1999), our results indicate that poor dietary behaviour, specifically irregular consumption of vegetables and breakfast, may be associated with adolescent mental health. Those students who consumed vegetables ≤ twice daily or who did not consume breakfast five days per week were 45% and 27%, respectively, more likely to report psychological distress.

Unexpectedly, weight status and use of alcohol or cannabis were not associated with psychological distress. One explanation may be related to a discrepancy in the operational definitions for these variables. In the current study,

Table 1. Descriptive characteristics of the study sample, N = 2935

	n	Weighted percentage
Sex		
Boys	1389	51.0
Girls	1546	49.0
Grade		
9	708	22.8
10	786	23.5
11	700	22.9
12	741	30.8
Weight status		
Not overweight	2226	74.7
Overweight	709	25.3
Past 7 days physical activity		
Meets physical activity recommendation	1348	44.0
Did not meet physical activity recommendation	1587	56.0
Past 7 days screen-time		
Meets screen-time recommendation	1152	37.8
Did not meet screen-time recommendation	1783	62.2
Past 7 days breakfast consumption		
Regular breakfast consumption	1443	48.6
Irregular breakfast consumption	1492	51.4
Past 7 days fruit consumption		
Adequate fruit consumption	831	26.8
Inadequate fruit consumption	2104	73.2
Past 7 days vegetable consumption		
Adequate vegetable consumption	787	25.5
Inadequate vegetable consumption	2148	74.5
Past 7 days soft drink consumption		
Did not consume soft drinks daily	2457	81.9
Consumed soft drinks daily	478	18.1
Past 12 months alcohol consumption		
Did not use alcohol	866	28.6
Used alcohol	2069	71.4
Past 12 months tobacco use		
Did not use tobacco	2502	84.5
Used tobacco	433	15.5
Past 12 months cannabis use		
Did not use cannabis	1949	66.1
Used cannabis	986	33.9
Psychological distress		
Without psychological distress	1915	64.9
With psychological distress (GHQ ≥ 3)	1020	35.1
	Mean	SD
Age, years	15.9	1.4
Parental education, years	14.4	1.8

Table 2. Logistic regression predicting psychological distress from socio-demographics, weight status, physical activity (PA), dietary and substance use behaviors, *N* = 2935

	OR	*P*	95%CI
Socio-demographics			
Sex (women = 1)	2.25	<0.001	1.90 to 2.66
Age, years	1.04	0.183	0.98 to 1.11
Parental education, years	0.97	0.281	0.93 to 1.02
Weight status			
Overweight/obese	1.04	0.668	0.86 to 1.26
Past 7 days physical and sedentary activity			
Did not meet PA recommendation	1.38	<0.001	1.17 to 1.63
Did not meet screen-time recommendation	1.37	<0.001	1.16 to 1.62
Past 7 days dietary behaviors			
Irregular breakfast consumption (<5 days = 1)	1.45	<0.001	1.23 to 1.71
Inadequate fruit consumption (<2 twice daily = 1)	1.09	0.412	0.89 to 1.34
Inadequate vegetable consumption (<2 twice daily = 1)	1.27	0.025	1.03 to 1.57
Daily consumption of soft drinks	1.08	0.486	0.87 to 1.35
Past 12 months substance use behaviors			
Used cannabis	1.04	0.730	0.85 to 1.27
Used tobacco	1.52	0.001	1.19 to 1.94
Used alcohol	1.17	0.115	0.96 to 1.42

OR = odds ratio, CI = confidence interval

the IOF (Cole et al., 2000) and WHO (2006) classifications for overweight and obesity were used to determine weight status, while alcohol and cannabis use were defined as "at least once over the previous 12 months." However, previous studies have used percentiles to determine weight status (e.g., Katon et al., 2010), and a 30-day period to assess substance use (e.g., Brown et al., 1999; Paxton et al., 2007). These measurement discrepancies may have resulted in the mixed findings. To further understand the relationship between adolescent mental health and health-risk behaviours, clear and consistent operational definitions of health-risk behaviours are warranted.

Caution is clearly required in such speculation given study limitations. The cross-sectional design precludes inferences regarding cause-effect relationships; further prospective study of these health-risk behaviours on adolescent mental health is warranted. The use of self-report instruments may be linked with a response bias for the measured health behaviours. The GHQ is not a clinical diagnostic; rather, it can only be used to identify symptoms associated with various psychological disorders. Further research should examine the prospective relationship between adolescent mental health and health-risk behaviours later in life, as well as test for moderators of this relationship. Sex may be one such moderator; however, other variables that were not assessed in the current study, such as ethnicity, should also be examined. Study strengths include the inclusion of a theoretical model (M-ABC; Taylor, 2010), the use of a Canadian dataset based on a full-probability design that maintains a high response rate, a large and heterogeneous sample with wide age variation, and a highly dispersed distribution of more than 150 schools, including students from urban and rural schools and all levels of socioeconomic status, the use of well-validated and reliable instruments, as well as the inclusion of dietary behaviour variables that have been shown to be problematic behaviours in adults with SMI.

Implications for Research and Practice

While there is evidence of an association between childhood mental health problems and increased likelihood of physical health problems later in early adulthood, future studies are required that can identify the possible mechanisms of these linkages (Goodwin et al., 2009). Our findings suggest that this link may be created in adolescence through the adoption of unhealthy behaviours including physical inactivity, smoking, and dietary behaviours. Childhood mental health problems may tend to persist in adulthood (e.g., Costello, Mustillo, Erkanli, Keeler, & Angold, 2003). In fact, there is an elevated risk of obesity and diabetes among adults with SMI (Allison et al., 2009; Ganguli &

Strassnig, 2011; Kisely, 2010), and a range of mechanisms have been suggested as underpinning this elevated risk, such as genetic and disease factors, medication side-effects, and lifestyle behaviours (Faulkner & Cohn, 2006). Speculatively, the foundation of this elevated risk in terms of health behaviour may be established in adolescence well before a clinical diagnosis of a mental illness. Greater awareness is warranted among clinicians of the health behaviours of their adolescent patients. Clinicians who see adolescents with mental health problems should address the health behaviours of their patients and intervene where possible to promote healthy lifestyle changes. Efforts to target these health-risk behaviours in adolescence may lead to improved mental and physical health in later life.

Conclusions

Consistent with US findings (Brooks et al., 2002; Katon et al., 2010; Mistry et al., 2009; Paxton et al., 2007), adolescent psychological distress was associated with being female, tobacco use, and not meeting PA and screen-time use recommendations. This study provides new evidence that skipping breakfast is also a correlate of psychological distress as well as preliminary support of the application of the M-ABC framework to the study of adolescent psychological distress and multiple health behaviour. The associations highlight the need for effective mental and physical health promotion in supportive settings, and for greater targeting of the physical health in adolescents at risk of mental health problems.

Acknowledgements / Conflicts of Interest

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