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Body image emotions, perceptions, and cognitions distinguish physically active and inactive smokers

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ABSTRACT

Objectives. To determine if body image emotions (body-related shame and guilt, weight-related stress), perceptions (self-perceived overweight), or cognitions (trying to change weight) differ between adolescents characterized by smoking and physical activity (PA) behavior.

Methods. Data for this cross-sectional analysis were collected in 2010–11 and were available for 1017 participants (mean (SD) age = 16.8 (0.5) years). Participants were categorized according to smoking and PA status into four groups: inactive smokers, inactive non-smokers, active smokers and active non-smokers. Associations between body image emotions, perceptions and cognitions, and group membership were estimated in multinomial logistic regression.

Results. Participants who reported body-related shame were less likely (OR (95% CI) = 0.52 (0.29–0.94)) to be in the active smoker group than the inactive smoker group; those who reported body-related guilt and those trying to gain weight were more likely (2.14 (1.32–3.48) and 2.49 (1.22–5.08), respectively) to be in the active smoker group than the inactive smoker group; those who were stressed about weight and those perceiving themselves as overweight were less likely to be in the active non-smoker group than the inactive smoker group (0.79 (0.64–0.97) and 0.41 (0.19–0.89), respectively).

Conclusion. Body image emotions and cognitions differentiated the active smoker group from the other three groups.

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Introduction

Negative body image is common in children and adolescents (Littleton and Ollendick, 2003). Based on theory and practice, body image is a multidimensional construct consisting of perceptions, cognitions, emotions, and behaviors pertaining to one's appearance, body shape and size (Cash and Pruzinsky, 2002). Negative body image is reflective of unfavorable perceptions, negative thoughts and feelings, and may trigger maladaptive actions or health-risk behaviors driven by body-related self-evaluation (Bane and McAuley, 1998). Maladaptive actions, including substance use and unhealthful physical activity (PA), are sometimes used to cope with negative body image. For example, both smoking and PA are used concurrently as weight control strategies among weight-conscious individuals (Lowry et al., 2002; Tomeo et al., 1999; Winter et al., 2002). Several dimensions of negative body image including emotions (e.g., weight dissatisfaction), perceptions (e.g., perceiving oneself as being overweight), and cognitions (e.g., trying to lose or control weight) have been associated with both smoking and PA (Forrester-Knauss and Zemp Stutz, 2012; Lowry et al., 2002; Neumark-Sztainer et al., 2006; Paxton et al., 2004; Tomeo et al., 1999; Winter et al., 2002). Furthermore, body-related self-conscious emotions such as shame and guilt, are modifiable factors that may also be associated with smoking and PA. Guilt is a motivating factor for PA in adolescent girls (Gillison et al., 2009). In adult females, body shame is positively associated with smoking to control appetite and weight (Fiissel and Lafreniere, 2006). Sabiston

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et al. (2007) found that body-related anxiety was related to engagement in or withdrawal from PA and smoking. Drawing from body image theories related to objectification (Fredrickson and Roberts, 1997), social comparison (Festinger, 1954), and self-discrepancy (Higgins, 1987), body-related emotions, perceptions, and cognitions may represent modifiable determinants of smoking and PA. In spite of the well-defined multidimensional nature of body image, researchers seldom explore all dimensions when studying health behavior outcomes. Instead, research has tended to focus on disordered eating at the expense of understanding other arguably more prominent maladaptive behaviors such as smoking and unhealthful levels of PA.

No study to date has compared body image-related correlates of levels of PA in adolescent smokers and non-smokers. Research has focused primarily on socio-demographic determinants of PA and smoking among adults (deRuiter et al., 2008; Gauthier et al., 2012; Ward et al., 2003). Given the potential health implications of unhealthful levels of PA and smoking behaviors, understanding how adolescents cope with negative body image is important to the development of effective intervention programs aimed at improving health through optimal PA and smoking abstinence. The objective of this study was to determine if body-related emotions (i.e., body-related shame, body-related guilt, weight-related stress), perceptions (i.e., self-perceived overweight), and cognitions (i.e., trying to change one's weight) in adolescents differed across four groups characterized by smoking and PA status. Given the theoretical propositions and empirical evidence (Festinger, 1954; Higgins, 1987; Fredrickson and Roberts, 1997; Sabiston et al., 2007; Tylka and Sabik, 2010), it was expected that more negative scores on all dimensions of body image would differentiate individuals with less favorable health behaviors. On the other hand, negative body image is also potentially associated with motivation to improve one's condition (i.e., Sabiston et al., 2007; Pila et al., 2014) and hence certain dimensions of body image may also be associated with more favorable health behaviors.

Material and methods

AdoQuest is a prospective longitudinal investigation of 1843 grade 5 Montreal students aged 10.8 (SD = 0.5), on average, at cohort inception in 2005. Details on AdoQuest have been published elsewhere (Low et al., 2012). The study received ethics approval from the Centre de Recherche du Centre Hospitalier de l'Université de Montréal. Data for this cross-sectional analysis were collected in 2010–11 when students were aged 16.8 (SD = 0.5) on average and in grade 10 or 11, in mailed self-report questionnaires completed by 1243 of the original 1843 participants (67%). Data on mother's education were collected in self-report questionnaires completed by 1435 parents in 2006 and/or 2009 (78% of those eligible).

Study variables

Participants were categorized as ever smokers if they answered "yes" to: "In your lifetime, have you ever smoked a cigarette, even just a puff?" Average number of cigarettes smoked in the last month was calculated from data on cigarette consumption for the preceding month, including number of days on which they had smoked and average number of cigarettes smoked per day (on days when they smoked). These two measures were multiplied to produce an estimate of average past month cigarette consumption.

Physical activity was assessed with the short self-administered International Physical Activity Questionnaire (IPAQ-SF) (Craig et al., 2003) which demonstrates reliability and validity against objective measures in adults (Craig et al., 2003) and adolescents (Rangul et al., 2008). Vigorous, moderate, and light PA were each measured in 2 items: "During the last 7 days, on how many days did you do vigorous/moderate/light physical activities?" and "On the days that you did vigorous/moderate/light physical activities, how many minutes did you usually do per day?" Minutes of light, moderate, and vigorous PA were multiplied by the number of days to create weekly totals of light, moderate and vigorous PA. Values for number of minutes of light, moderate, and vigorous PA exceeding 180 min per day were truncated at 180 min, in accordance with recommendations in the Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ) (2005). Participants were classified as meeting current moderate-to-vigorous physical activity (MVPA) recommendations if they reported engaging in at least 420 min of MVPA per week (Canadian Society for Exercise Physiology, 2010). For ease of presentation, participants who met or did not meet MVPA recommendations are hereafter labeled "active" and "inactive", respectively.

The Weight- and Body-Related Shame and Guilt Scale (WEB-SG) (Conradt et al., 2007) includes 6 items measuring shame (e.g., "I am ashamed of myself when others get to know how much I really weigh") and 6 items measuring guilt (e.g., "When I can't manage to work out physically, I feel guilty"). Response choices range from 1 (never) to 5 (always). An average score was calculated for the shame and guilt subscales. The internal consistency of the WEB-SG subscale scores (Cronbach alpha coefficients range: 0.86–0.92), and the convergent and discriminant validity have been demonstrated (Conradt et al., 2007). Cronbach alpha coefficients for the shame and guilt subscales scores in the current sample were 0.88 and 0.93, respectively. Guilt differs from shame in that it reflects a negative evaluation of one's specific behavior, whereas shame reflects a negative evaluation of the self. In addition, shame and guilt are distinguished by their adaptiveness, such that guilt has the potential to motivate behavior change but shame is reliably maladaptive (Tangney and Dearing, 2002). Due to the high correlation between these constructs, guilt and shame were examined by statistically partialling out shared variance using regression analysis, leaving constructs labeled shame-free guilt and guilt-free shame (Tangney and Dearing, 2002). Shame-free guilt represents the behavior-focused, adaptive and psychological adjustment aspects of guilt that are thought to distinguish it from shame, while guilt-free shame represents the self-focused maladaptive aspects of shame that distinguish it from guilt (Tangney and Dearing, 2002).

Self-perceived overweight was assessed by: "Do you consider yourself to be: (i) too thin, (ii) normal weight, (iii) a little overweight, or (iv) very overweight?" Self-perceived overweight was dichotomized and coded "yes" for participants who responded "a little overweight" or "very overweight," and "no" for participants to responded "too thin" or "normal weight."

Trying to change weight (Rosen, 1987) was assessed by: "At this point in time, are you trying to: (i) maintain your weight, (ii) lose weight, (iii) gain weight, or (iv) do nothing about your weight". Trying to change weight was coded "no" (for participants who responded "maintain weight" or "do nothing about your weight,"), "lose weight," and "gain weight."

Weight-related stress (Deschesnes, 1997) was measured by: "In your lifetime, have you experienced changes in your weight or physical appearance that you did not like?" Participants who experienced changes in their weight or physical appearance that they did not like were asked to rate the level of stress that this caused them on a 5-point scale ranging from (1) not at all stressful to (5) extremely stressful. All other participants who did not report having experienced changes in their weight or physical appearance that they did not like were coded 0.

Covariates included participant's Body Mass Index (BMI), sex, and mother's education. BMI was calculated using data on self-reported height and weight collected in 2006 and 2009. To reduce missing data, 2006 data on height and weight were used among 26 (2.6%) participants for whom 2009 data were not available. BMI, calculated by dividing weight in kilograms by height in meter squared, was transformed to sex- and age-specific BMI percentiles according to the 2000 Centers for Disease Control and Prevention (CDC) growth charts (Kuczmarski et al., 2002). BMI percentiles computed using 2006 data were adjusted for average percentage change in BMI percentile from 2006 to 2009. Data on

Table 1
Selected characteristics of participants according to smoking and physical activity status, AdoQuest 2010–2011.

	Inactive		Active	
	Smokers (n = 394)	Non-smokers (n = 378)	Smokers (n = 107)	Non-smokers (n = 138)
	% or mean (SD)		% or mean (SD)	
Sociodemographic characteristics				
Age, years				
14–15	4	9	6	2
16–17	96	91	94	98
Male	32	40	64	64
Mother university-educated				
Yes	17	21	17	38
No	68	62	63	55
Missing	15	17	20	7
Caucasian	93	91	96	94
Income ($ CAN)				
<30,000	7	6	5	4
30,000–99,999	51	44	52	41
≥100,000	20	30	24	44
Missing	22	20	19	11
Smoking-related characteristics				
No. years since smoking initiation	3.3 (1.8)	N/A	3.3 (1.8)	N/A
No. cigarettes smoked per month	69.3 (146.8)	N/A	51.8 (123.71)	N/A
No. lifetime quit attempts				
0	68	N/A	65	N/A
1	16		19	
2	9		10	
3–4	5		6	
≥5	2		0	
Body-related characteristics				
BMI percentile	54.6 (26.4)	52.7 (29.4)	61.2 (26.4)	55.7 (26.8)
Perceived overweight	23	21	23	13
Trying to change weight				
No	56	65	47	64
Lose weight	33	27	27	20
Gain weight	11	8	26	16
Weight-related stress[a]	32	24	21	12
Body shame	1.8 (1.0)	1.7 (0.9)	1.7 (0.8)	1.5 (0.6)
Body guilt	1.9 (1.1)	1.7 (0.9)	1.9 (1.1)	1.5 (0.8)

[a] Stress about weight was dichotomized as 0 = no (not at all stressful), 1 = yes (a little stressful/somewhat stressful/very stressful/extremely stressful).

mother's education (mother is university-educated; yes/no) were drawn from the parent questionnaire. To reduce missing data, 2006 data on mother's education were used for 139 (13.7%) participants for whom 2009 data were missing.

Statistical analysis

Data on PA, body-related shame and body-related guilt were collected in 2010–2011 (grade 11) only. Consequently, the present study is restricted to a cross sectional analysis of the data collected in 2010–2011. Participants were categorized into one of four categories according to ever smoking and meeting MVPA status: inactive non-smokers, active non-smokers, inactive smokers, and active smokers. Descriptive statistics were computed for the four groups.

The associations between body-related emotions, perceptions, and cognitions, and smoking/PA group were estimated in multinomial logistic regression models. The correlation between shame and guilt was high ($r = 0.84$) and remained high after partialling out the shared variance ($r = -0.84$); guilt-free shame and shame-free guilt were therefore examined in separate multinomial logistic models. Preliminary analyses indicated that there were no statistically significant sex interactions in any association and therefore all analyses were conducted

Table 2
Odds ratio (OR) (95% CI) for the association between body-related variables (including guilt-free shame), and smoking/physical activity status group.

	Inactive		Active	
	Smokers	Non-smokers	Smokers	Non-smokers
	OR_{adj}	OR_{adj} (95% CI)	OR_{adj} (95% CI)	OR_{adj} (95% CI)
Mother university-educated (ref = no)	1.00	1.44 (0.97–2.13)	1.18 (0.64–2.20)	2.60 (1.61–4.22)
Sex (ref = female)	1.00	1.63 (1.11–2.39)	3.06 (1.64–5.72)	3.06 (1.83–5.10)
BMI percentile[a]	1.00	1.00 (0.99–1.01)	1.01 (1.00–1.02)	1.00 (0.99–1.01)
Guilt-free shame[a]	1.00	1.41 (0.98–2.02)	0.52 (0.29–0.94)	0.99 (0.56–1.74)
Weight-related stress[a]	1.00	0.90 (0.79–1.03)	0.99 (0.80–1.22)	0.79 (0.64–0.97)
Self-perceived overweight (ref = no)	1.00	0.96 (0.58–1.58)	1.17 (0.56–2.46)	0.41 (0.19–0.89)
Trying to change weight (ref = no change)				
Lose weight	1.00	0.80 (0.51–1.26)	0.87 (0.42–1.82)	1.00 (0.53–1.89)
Gain weight	1.00	0.62 (0.34–1.13)	2.49 (1.22–5.08)	0.93 (0.47–1.84)

[a] Included in the model as a continuous variable.

Table 3
Odds ratio (OR) (95% CI) for the association between body-related variables (including shame-free guilt), and smoking/physical activity status group.

	Inactive		Active	
	Smokers	Non-smokers	Smokers	Non-smokers
	OR_{adj}	OR_{adj} (95% CI)	OR_{adj} (95% CI)	OR_{adj} (95% CI)
Mother university-educated (ref = no)	1.00	1.44 (0.97–2.13)	1.17 (0.63–2.18)	2.60 (1.60–4.21)
Sex (ref = female)	1.00	1.60 (1.09–2.34)	3.46 (1.83–6.57)	3.05 (1.82–5.11)
BMI percentile[a]	1.00	1.00 (0.99–1.01)	1.01 (1.00–1.02)	1.00 (0.99–1.01)
Shame-free guilt[a]	1.00	0.82 (0.60–1.13)	2.14 (1.32–3.48)	1.02 (0.62–1.65)
Weigh-related stress[a]	1.00	0.92 (0.81–1.05)	0.93 (0.76–1.15)	0.79 (0.64–0.97)
Self-perceived overweight (ref = no)	1.00	1.04 (0.63–1.70)	1.11 (0.53–2.31)	0.41 (0.19–0.88)
Trying to change weight (ref = no change)				
Lose weight	1.00	0.81 (0.51–1.28)	0.75 (0.35–1.58)	0.99 (0.52–1.90)
Gain weight	1.00	0.63 (0.34–1.14)	2.46 (1.21–5.05)	0.94 (0.47–1.86)

[a] Included in the model as a continuous variable.

using the sample pooled across sex. Models were adjusted for sex, mother's education, and BMI percentile. All statistical tests were two-sided, with a significance level of 0.05. Analyses were conducted using Stata (Stata, version 12).

Results

Data on smoking and PA were available for 1032 participants. Fifteen participants aged 18–20 years were excluded since they represented only 1% of the sample (compared to 6% and 93% of the participants aged 14–15 years and 16–17 years, respectively). Therefore, 1017 participants were retained for analysis. Compared to the 826 AdoQuest participants not retained in the analyses, a higher proportion of those retained was female (57% vs. 51%; $p = 0.01$) and had a university-educated mother (21% vs. 13%; $p < 0.001$).

Only 24% of the participants were active (i.e., met MVPA guidelines). Half of the participants (49%) reported ever smoking. Active and inactive smokers did not differ in mean number of years since smoking initiation (3.3 and 3.3 years, respectively; $t(447) = 0.06$, $p = 0.95$), mean number of cigarettes smoked per month (51.8 and 69.3 cigarettes per month, respectively; $t(435) = 1.05$, $p = 0.30$), or lifetime number of quit attempts ($\chi 2(4) = 1.81$, $p = 0.77$) (Table 2).

Inactive non-smokers, active non-smokers, inactive smokers, and active smokers comprised 38%, 13% 39% and 10% of the sample, respectively. Descriptive data for these four groups are presented in Table 1. Most participants were Caucasian and there was little difference in race or age across the four groups. There was a statistically significant ($p < 0.001$) higher proportion of males in the two active groups. One-third of inactive smokers felt stressed about their weight, compared to 24% of inactive non-smokers, 21% of active smokers, and 12% of active non-smokers. A lower proportion of the active non-smoker group reported self-perceived overweight and trying to change weight. A higher proportion of smokers than non-smokers reported trying to lose weight. The active non-smokers group had the lowest scores for body-related shame and guilt.

Results for the multinomial logistic regression models are presented in Table 2 (i.e., the model with guilt-free shame) and Table 3 (i.e., the model with shame-free guilt). The reference category in both Tables 2 and 3 was inactive smokers. Coefficients for variables other than guilt-free shame and shame-free guilt were similar in magnitude and direction across the two models. Specifically, participants who perceived themselves as overweight and those who reported feeling stressed about their weight were less likely to belong to the active non-smokers group. Participants who reported trying to gain weight were more likely to be active smokers.

Participants who reported feeling guilt-free shame about their bodies were less likely to be active smokers (Table 2), and those who reported feeling shame-free guilt were more likely to be active smokers (Table 3).

Discussion

The objective of this study was to assess if body image-related emotions, perceptions, and cognitions differ across four groups of adolescents characterized by smoking and PA status. The results suggest that active adolescent smokers may engage in PA as a strategy to try to gain weight. Specifically, while 64% of both active smoker and non-smoker groups was male, 26% of the former compared to 16% of the latter group reported trying to gain weight (Table 1). Further, compared to non-smokers, a greater proportion of active smokers (38% versus 25%; data not shown), reported trying to gain weight. It is possible that active smokers attempt to gain weight in the form of increased muscle mass (McCreary and Sasse, 2000; O'Dea and Rawstorne, 2001) by engaging in physical activity. McCabe and Ricciardelli (2001a) reported that 48% of normal-weight adolescent boys either want to or are trying to gain weight and that exercise is the most frequent strategy used by boys to change body size or shape (McCabe and Ricciardelli, 2001b). PA interventions targeted to adolescent smokers, and in particular to males, should therefore include information on how smoking negatively affects the ability to increase muscle mass negatively (Montes de Oca et al., 2008; Petersen et al., 2007), and is associated with greater abdominal and visceral fat accumulation (Chiolero et al., 2008; Akbartabartoori et al., 2004).

In this study, adolescents who reported body-related guilt were more likely to be active smokers, while those who reported feeling body-related shame were less likely to be active smokers. This result concords with the notion that guilt is associated with reparative action (Tangney and Dearing, 2002). The cross-sectional nature of our data precludes the assessment of the directionality of the association observed; however, if guilt precedes and influences engagement in PA, then higher levels of guilt may foster feelings of personal responsibility in individuals who engage in unhealthy behaviors, leading them to seek strategies to restore their sense of physical self. It is possible that adolescent smokers with higher levels of body-related guilt turn to PA to restore their sense of physical self or reduce the negative consequences of their actions (such as smoking) and emotions. While body-related guilt may drive adolescent smokers to engage in PA, using guilt as a motivator for PA may not be an effective strategy for sustained PA participation. Research indicates that motivation for engaging in PA that is based on choice and volition, as opposed to pressure and tension (i.e., anchored in guilt), is associated with greater frequency of PA (Daley and Duda, 2006), stronger intentions to continue exercising (Thogersen-Ntoumani and Ntoumanis, 2006), and long term PA adherence (Teixeira et al., 2012).

Limitations

Limitations include the cross-sectional study design, which precludes inferences about the directionality or the causal nature of the

associations observed. Participants were drawn from a convenience sample of schools so that the results may not be generalizable to other populations of adolescents. However, participants in this study were similar in terms of several health-related behaviors including smoking and PA, to a representative sample of adolescents attending secondary school in the province of Quebec (Institut de la statistique-Quebec, 2004). The use of self-reports of PA may result in misclassification since children and adolescents tend to overestimate their PA behavior (Sallis and Saelens, 2000; Shiely and MacDonncha, 2009).

Conclusion

Body image emotions and cognitions differentiate active adolescent smokers from other adolescents and may represent useful targets for PA intervention in adolescent smokers. Specifically, body-related guilt and the desire to gain weight are associated with being active and smoking.

Conflict of interest statement

The authors declare that there are no conflicts of interest.

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References

Akbartabartoori, M., Lean, M.E.J., Hankey, C.R., 2004. Relationships between cigarette smoking, body size and body shape. Int. J. Obes. Relat. Metab. Disord. 29, 236–243.
Bane, S., McAuley, E., 1998. Body image and exercise. In: Duda, J.L. (Ed.), Advances in Sport and Exercise Psychology Measurement. Fitness Information Technology, Morgantown, WV.
Canadian Society for Exercise Physiology, 2010. Canadian Physical Activity Guidelines — Youth. CSEP, Ottawa (ON).
Cash, T.F., Pruzinsky, T., 2002. Body Image: A Handbook of Theory, Research, and Clinical Practice. Guilford, New York.
Chiolero, A., Faeh, D., Paccaud, F., Cornuz, J., 2008. Consequences of smoking for body weight, body fat distribution, and insulin resistance. Am. J. Clin. Nutr. 87, 801–809.
Conradt, M., Dierk, J., Schlumberger, P., Rauh, E., Hebebrand, J., Rief, W., 2007. Development of the Weight- and Body-Related Shame and Guilt Scale (WEB-SG) in a nonclinical sample of obese individuals. J. Pers. Assess. 88, 317–327.
Craig, C.L., Marshall, A.L., Sjostrom, M., Bauman, A.E., Booth, M.L., Ainsworth, B.E., Pratt, M., Ekelund, U.L.F., Yngve, A., Sallis, J.F., Oja, P., 2003. International physical activity questionnaire: 12-country reliability and validity. Med. Sci. Sports Exerc. 195, 3508–4381.
Daley, A.J., Duda, J.L., 2006. Self-determination, stage of readiness to change for exercise, and frequency of physical activity in young people. Eur. J. Sport Sci. 6, 231–243.
deRuiter, W.K., Faulkner, G., Cairney, J., Veldhuizen, S., 2008. Characteristics of physically active smokers and implications for harm reduction. Am. J. Public Health 98, 925–931.
Deschesnes, M., 1997. Life Style of Youth in Secondary Schools in Outaouais [in French]. Public Health Directorate, Regional Directorate of Health and Social Services, Hull, Quebec, Canada.
Festinger, L., 1954. A theory of social comparison processes. Hum. Relat. 7, 117–140.
Fiissel, D.L., Lafreniere, K.L., 2006. Weight control motives for cigarette smoking: further consequences of the sexual objectification of women? Fem. Psychol. 16, 327–344.
Forrester-Knauss, C., Zemp Stutz, E., 2012. Gender differences in disordered eating and weight dissatisfaction in Swiss adults: which factors matter? BMC Public Health 12, 809.
Fredrickson, B.L., Roberts, T.-A., 1997. Objectification theory. Psychol. Women Q. 21, 173–206.
Gauthier, A.P., Snelling, S.J., King, M., 2012. "Thinking outside the pack": examining physically active smokers and implications for practice among Ontario residents. Health Promot. Pract. 13, 395–403.
Gillison, F., Osborn, M., Standage, M., Skevington, S., 2009. Exploring the experience of introjected regulation for exercise across gender in adolescence. Psychol. Sport Exerc. 10, 309–319.
Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ), 2005. Short and long forms.
Higgins, E.T., 1987. Self-discrepancy: a theory relating self and affect. Psychol. Rev. 94 (3), 319–340.
Institut de la statistique-Quebec, 2004. Enquête québecoise sur le tabac, l'alcool, la drogue et le jeu chez les élèves du secondaire.
Kuczmarski, R.J., Ogden, C.L., Guo, S.S., Grummer-Strawn, L.M., Flegal, K.M., Mei, Z., Wei, R., Curtin, L.R., Roche, A.F., Johnson, C.L., 2002. 2000 CDC growth charts for the United States: methods and development. Vital Health Stat. 11.
Littleton, H., Ollendick, T., 2003. Negative body image and disordered eating behavior in children and adolescents: what places youth at risk and how can these problems be prevented? Clin. Child. Fam. Psychol. Rev. 6, 51–66.
Low, N.C., Dugas, E., O'Loughlin, E., Rodriguez, D., Contreras, G., Chaiton, M., O'Loughlin, J., 2012. Common stressful life events and difficulties are associated with mental health symptoms and substance use in young adolescents. BMC Psychiatry 12, 116.
Lowry, R., Galuska, D.A., Fulton, J.E., Wechsler, H., Kann, L., 2002. Weight management goals and practices among U.S. high school students: associations with physical activity, diet, and smoking. J. Adolesc. Health 31, 133–144.
McCabe, M.P., Ricciardelli, L.A., 2001a. Parent, peer, and media influences on body image and strategies to both increase and decrease body size among adolescent boys and girls. Adolescence 36, 225–240.
McCabe, M.P., Ricciardelli, L.A., 2001b. Body image and body change techniques among young adolescent boys. Eur. Eat. Disord. Rev. 9, 335–347.
McCreary, D.R., Sasse, D.K., 2000. An exploration of the drive for muscularity in adolescent boys and girls. J. Am. Coll. Health 48, 297–304.
Montes de Oca, M., Loeb, E., Torres, S.H., De Sanctis, J., Hernandez, N., Talamo, C., 2008. Peripheral muscle alterations in non-COPD smokers. Chest 133, 13–18.
Neumark-Sztainer, D., Paxton, S.J., Hannan, P.J., Haines, J., Story, M., 2006. Does body satisfaction matter? Five-year longitudinal associations between body satisfaction and health behaviors in adolescent females and males. J. Adolesc. Health 39, 244–251.
O'Dea, J., Rawstorne, P., 2001. Male adolescents identify their weight gain practices, reasons for desired weight gain, and sources of weight gain information. J. Am. Diet. Assoc. 101, 12–23.
Paxton, R.J., Valois, R.F., Drane, J.W., 2004. Correlates of body mass index, weight goals, and weight-management practices among adolescents. J. Sch. Health 74, 136–143.
Petersen, A.M., Magkos, F., Atherton, P., Selby, A., Smith, K., Rennie, M.J., et al., 2007. Smoking impairs muscle protein synthesis and increases the expression of myostatin and MAFbx in muscle. Am. J. Physiol. Endocrinol. Metab. 293, E843–E848.
Pila, E., Stamiris, A., Castonguay, A., Sabiston, C., 2014. Body-related envy: a social comparison perspective in sports ans exercise. J. Sport Exerc. Psychol. 36, 93–106.
Rangul, V., Holmen, T.L., Kurtze, N., Cuypers, K., Midthjell, K., 2008. Reliability and validity of two frequently used self-administered physical activity questionnaires in adolescents. BMC Med. Res. Methodol. 8, 47.
Rosen, J.C., 1987. The validity of self-reported weight loss and weight gain efforts in adolescents. Int. J. Eat. Disord. 6, 515–523.
Sabiston, C.M., Sedgwick, W.A., Crocker, P.R.E., Kowalski, K.C., Stevens, D., 2007. Social physique anxiety in adolescents: an examination of influences, coping strategies and health behaviours. J. Adolesc. Res. 22, 78–101.
Sallis, J.F., Saelens, B.E., 2000. Assessment of physical activity by self-report: status, limitations, and future directions. Res. Q. Exerc. Sport 71, S1–S14.
Shiely, F., MacDonncha, C., 2009. Meeting the international adolescent physical activity guidelines: a comparison of objectively measured and self-reported physical activity levels. Ir. Med. J. 102, 15–19.
Tangney, J.P., Dearing, R.L., 2002. Shame and Guilt. Guilford, New York.
Teixeira, P.J., Carraca, E.V., Markland, D., Silva, M.N., Ryan, R.M., 2012. Exercise, physical activity, and self-determination theory: a systematic review. Int. J. Behav. Nutr. Phys. Act. 9, 78.
Thogersen-Ntoumani, C., Ntoumanis, N., 2006. The role of self-determined motivation in the understanding of exercise-related behaviours, cognitions and physical self-evaluations. J. Sports Sci. 24, 393–404.
Tomeo, C.A., Field, A.E., Berkey, C.S., Colditz, G.A., Frazier, A.L., 1999. Weight concerns, weight control behaviors, and smoking initiation. Pediatrics 104, 918–924.
Tylka, T.L., Sabik, N.J., 2010. Integrating social comparison theory and self-esteem within objectification theory to predict women's disordered eating. Sex Roles 63, 18–31.
Ward, K.D., Vander Weg, M.W., Klesges, R.C., Kovach, K.W., Elrod, M.C., DeBon, M., Haddock, C.K., Talcott, G.W., Lando, H.A., 2003. Characteristics of highly physically active smokers in a population of young adult military recruits. Addict. Behav. 28, 1405–1418.
Winter, A.L., de Guia, N.A., Ferrence, R., Cohen, J.E., 2002. The relationship between body weight perceptions, weight control behaviours and smoking status among adolescents. Can. J. Public Health 93, 362–365.