Spinal Cord (2011) 49, 266–272

www.nature.com/sc

ORIGINAL ARTICLE

Secondary complications and subjective well-being in individuals with chronic spinal cord injury: associations with self-reported adiposity

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Study design: This is a cross-sectional study.
Objectives: To examine the associations between adiposity, secondary complications and subjective well-being (SWB) in individuals with spinal cord injury (SCI).
Setting: Parkwood Hospital (London); Hamilton Health Sciences-Chedoke Site and McMaster University (Hamilton); Toronto Rehabilitation Institute, Lyndhurst Centre (Toronto); and St Mary's of the Lake Hospital and Queen's University (Kingston), Ontario, Canada.
Methods: A total of 531 men and 164 women ($N=695$) enrolled in the Study of Health and Activity in People with Spinal Cord Injury (SHAPE-SCI) completed the Secondary Health Complications Survey, SF-36 pain subscale, Satisfaction with Life Scale (SWLS) and the Patient Health Questionnaire-9 (PHQ) during a telephone interview. Body mass index (BMI) measurements were obtained from a subsample of the SHAPE-SCI participants ($n=73$) during a home visit.
Results: Controlling for covariates, individuals who reported being overweight were more likely to have a history of overuse injuries and fatigue, experienced a greater impact of overuse injuries and fatigue, had greater pain and depressive symptoms, and had lower satisfaction with life than individuals who did not report being overweight. BMI was only associated with an increased likelihood of reporting spasticity.
Conclusion: Self-reported overweight status was associated with an increased prevalence of certain secondary complications and lower SWB. Future prospective studies should examine whether reductions in adiposity are associated with changes in the prevalence and the impact of secondary complications and SWB.
Spinal Cord (2011) **49**, 266–272; doi:10.1038/sc.2010.100; published online 24 August 2010

Keywords: spinal cord injury; secondary complications; subjective well-being; overweight; pain; satisfaction with life

Introduction

One of the most prevalent comorbidities reported after spinal cord injury (SCI) is an increase in adiposity. Approximately 66% of individuals with SCI are overweight or obese.[1] Given the limitations of obesity-related measurement for persons with SCI, this statistic likely underestimates the true prevalence of overweight and obesity in the SCI population.[2] In both the able-bodied and the SCI populations, excess body fat has been associated with an elevated risk of many chronic diseases, including, but not limited to, cardiovascular disease and diabetes.[3]

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Received 2 November 2009; revised 30 June 2010; accepted 4 July 2010; published online 24 August 2010

In addition to chronic diseases, individuals with SCI report myriad injury-related comorbidities and complications, including bladder problems, pressure sores, pain, spasticity and fatigue.[4,5] Nearly 95% of individuals with SCI currently have at least one secondary complication, whereas the majority of these individuals (58%) have three or more complications.[4] However, little is know about the relationship between elevated adiposity (that is, body fatness and overweight) and the secondary complications frequently experienced by individuals with SCI.

Two common secondary complications that may be associated with adiposity in individuals with SCI are pain and overuse injuries. Pain and overuse injuries of the upper limb joints have been reported to affect over 72% of individuals with SCI.[6] In the able-bodied population, overweight and obesity have been linked to osteoarthritis[7] of the weight-bearing joints, which may also increase pain. Individuals with SCI perform a variety of unique mobility activities (for example, wheelchair propulsion and transferring) that put stress on the upper limb joints. As bodyweight increases, these structures may be subjected to greater strain.[8,9] Therefore, we hypothesized that in people with SCI increased adiposity may be associated with overuse injuries and pain particularly in the upper limb joints.

Fatigue is another commonly reported complication that may be associated with adiposity in individuals with SCI. Approximately 57% of individuals with SCI suffer from fatigue.[10] In the able-bodied population, overweight and obesity have been related to an increase in fatigue due to physiological, psychological and sleep disturbances.[11] In the SCI population, this relationship is yet to be examined. We hypothesized that individuals who reported being overweight would report greater fatigue than individuals who did not report being overweight.

In addition to having implications for physical health, elevated adiposity may also be negatively associated with subjective well-being (SWB) in the SCI population. SWB is a term often used to describe a collection of constructs that take into account one's emotional well-being, domain satisfactions and global judgments of life satisfaction.[12] For the purpose of this study, both depression and satisfaction with life were considered measures of SWB. In the able-bodied population, obesity is associated with poorer SWB.[13] However, the relationship between adiposity and SWB has not been examined in the SCI population. It was hypothesized that similar to the findings from the able-bodied population, individuals with SCI who reported being overweight, would report poorer SWB (that is, poorer life satisfaction and depressive symptoms) than individuals with SCI who did not report being overweight.

The primary purpose of this study was to examine the relationships between adiposity, secondary health complications associated with SCI and SWB. In this study, adiposity was operationalized using both objective and subjective measures. For the objective assessment of adiposity, measured height and weight were used to calculate body mass index (BMI; weight in kg/height in m^2, World Health Organization, 2000). However, it has been suggested that objective measures of health status are often poor predictors of perceived health and well-being.[14,15] Furthermore, BMI seems to be an inadequate measure of adiposity in the SCI population.[2] Given these limitations, we also included a self-report measure of overweight, whereby participants indicated whether they considered themselves to be overweight. These two measures were used to examine the relationships between adiposity, secondary complications and SWB.

We hypothesized that the relationships between adiposity, secondary complications and SWB would be stronger for self-reported adiposity. Indeed, earlier research has demonstrated that subjective measures of physical functioning and health are more accurate predictors of SWB outcomes compared to objective measures.[14,15] Thus, it was hypothesized that individuals who considered themselves overweight would have an increased prevalence of other secondary complications particularly pain, fatigue and overuse injuries. Furthermore, it was expected that individuals who considered themselves overweight would have significantly poorer life satisfaction and more depressive symptoms.

Materials and methods

This study involved an analysis of data from 695 individuals who participated in the Study of Health and Activity in People with Spinal Cord Injury.[16] The SHAPE-SCI is a multicenter, prospective study examining health and daily activity levels in people with a traumatic SCI. Participants completed the Secondary Health Complications Survey, SF-36 pain subscale,[17] Satisfaction with Life Scale,[18] and the Patient Health Questionnaire-9[19] via the telephone. BMI measurements were obtained from a subsample of the SHAPE-SCI participants ($n = 73$) during a home visit within 14 days of the telephone interview. The smaller subsample was due to the limitations involved in collecting data within the participants' home.

Participants

The study sample included all 695 participants enrolled in the baseline data collection for the SHAPE-SCI. Participant demographic characteristics are presented in Table 1. All 695 participants were included in the analyses examining how *self-reported* overweight status related to secondary complications and SWB. The objective measure of BMI was only taken in a subsample of SHAPE-SCI participants. Thus, only the data from 73 participants were used in the analyses that included *objectively* measured adiposity. A full list of the measures as well as inclusion and exclusion criteria of the SHAPE-SCI are reported elsewhere.[16] Briefly, study inclusion criteria consisted of (a) traumatic SCI etiology, (b) $\geqslant 18$ years of age, (c) assistance required for mobility (for example, manual or power wheelchair, walker, braces, cane), (d) SCI years post injury >12 months, (e) proficient in reading and speaking English and (f) no self-reported cognitive or memory impairments. All applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during the course of this research.

Measures

Body mass index. BMI was calculated as weight in kilograms divided by height in meters-squared ($kg\,m^{-2}$). Height and weight measurements were obtained in the participants' home by a trained research assistant. Weight was measured using a portable, digital ang wheelchair scale (Health O Meter 2450KL, Brooklyn, NY, USA). Height was then measured in a supine position while on a spine board using a flexible, non-elastic tape measure (Gulick II Tape Measure, Gay Mills, WI, USA).

Secondary health complications. The Secondary Health Complications Survey was adapted from the Secondary Conditions Questionnaire[20] and the SCI Secondary Conditions Scale.[21] The survey lists 13 common secondary health complications associated with SCI. Participants were asked

Table 1 Participant demographic characteristics

	N[a]	Mean ± s.d./n (%)
Age (mean ± s.d.)	694	46.83 ± 13.42 years
Years post injury (mean ± s.d.)	692	15.29 ± 11.10 years
Sex	695	
Men		531 (76.4%)
Women		164 (23.6%)
Impairment	678	
Paraplegia		320 (47.2%)
Tetraplegia		358 (52.8%)
Injury severity n(%)	686	
C1–C4, ASIA A, B, C		75 (10.8%)
C5–C8, ASIA A, B, C		184 (26.5%)
T1–S5, ASIA A, B, C		255 (36.7%)
AISA D at any level		172 (24.7%)
Type of mobility	695	
Manual wheelchair		389 (56.0%)
Power wheelchair		221 (31.8%)
Ambulate with assistive device		85 (12.2%)

[a]Number of participants differed due to incomplete data.

to indicate ('yes' or 'no') whether they had experienced each complication listed within the past 12 months. With the exception of the overweight category, participants who reported a particular complication (that is, responded 'yes') were also asked to rate the impact of the complication on their daily life over the past 12 months using a five-point scale (0 = none at all; 4 = very severe impact). The secondary complications examined included overweight, spasticity, overuse injuries, fatigue, urinary tract infection, respiratory infection, pressure sores, osteoporosis, broken bones or joint dislocations, blood clots or deep vein thrombosis, and other infections. A 'yes' response to overweight was used as an indicator of self-reported adiposity. Studies using a similar self-report measurement paradigm for assessing the prevalence[20] and the impact[21] have demonstrated test-retest reliability and convergent validity. The scale is shown in Table 2.

Pain. Pain was assessed using the two-item pain subscale of the SF-36.[17] Respondents reported the severity of their pain on a five-point scale (0 = none; 4 = very severe) and the impact of pain on their daily life on a six-point scale (0 = none; 5 = extremely). This subscale has been validated to assess overall pain perception[22] and has been used previously in the SCI population.[23]

Subjective well-being (SWB). SWB was assessed using the Satisfaction with Life Scale[18] and the Patient Health Questionnaire-9.[19] The Satisfaction with Life Scale is a global measure of one's cognitive judgments in regard to life satisfaction. Participants answered five questions on a seven-point Likert scale (1 = strongly disagree; 7 = strongly agree). The five-item scale has been validated, demonstrated high internal consistency in this study (Cronbach's $\alpha = 0.84$), and has been used previously among persons with SCI.[24] The Patient Health Questionnaire-9 is an indicator of depressive symptoms. Participants answered nine questions on a four-point scale (0 = not at all; 3 = every day). The nine-item scale has been validated,[19] demonstrated high internal consistency in this study (Cronbach's $\alpha = 0.80$), and has been used previously in persons with SCI.[25]

Statistical analyses
Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS version 16.0, Chicago, IL, USA). Potential (demographic) covariates were identified by examining the relationships between secondary complications, SWB and demographic characteristics. ANOVA was used for categorical data (for example, secondary health complications) and Pearson's bivariate two-tailed correlations were used for continuous data (for example, BMI, pain and SWB).

A series of three statistical tests were used to examine our hypotheses. Multiple approaches were necessary to accommodate for categorical and continuous independent variables and to control for covariates. First, to test the relationship between adiposity (subjective and objective; independent variable) and the occurrence of secondary health complications (dependent variable), we conducted separate logistic regressions on each of the dichotomized ('yes' or 'no') secondary health complications outcomes. Second, to test the relationships between adiposity (independent variable) and both pain and SWB (dependent variables), separate ANOVAs were conducted for the self-reported measure of adiposity (self-reported overweight item). Partial correlations were conducted for the objective measure of adiposity (BMI).

Separate ANOVAs were conducted to examine the relationship between self-reported adiposity (independent variable) and the impact of each secondary complication (dependent variable). Partial correlations were conducted to examine the relationship between BMI (independent variable) and the impact of each secondary complication (dependent variable).

Results

Measurement properties of the self-reported indicator of overweight
Exploratory analyses were conducted using the subsample from the SHAPE-SCI ($n = 69$–73) to determine the concurrent validity of the self-reported overweight item on the Secondary Health Complications Survey. The point bi-serial correlation for self-reported overweight status and BMI was significant ($r_{pb} = 0.68$, $P < 0.001$). In comparison to participants who reported themselves not to be overweight, those participant who reported being overweight had a higher BMI (31.57 ± 9.2 vs $23.4 \pm 3.5\,\mathrm{kg\,m^{-2}}$) $F(1,70) = 58.49$, $P < 0.001$, waist circumference measured at the point between the iliac crest and lowest rib (105.36 ± 2.70 vs 86.69 ± 1.59 cm) $F(1,72) = 35.50$, $P < 0.001$, and fat percentage ($33.4 \pm 2.0\%$ vs $26.3 \pm 1.2\%$) $F(1,67) = 9.52$, $P < 0.003$, measured by bioelectrical impedance.

Table 2 Secondary Health Complications Survey

	Have you had this problem in the past 12 months?		How much of an impact has this complication had on your daily life in the past 12 months?				
	No	Yes	None at All	Small Impact	Moderate Impact	Severe Impact	Very Severe Impact
Spasticity							
Overuse Injury (shoulder/elbow/wrist)							
Fatigue							
Urinary Tract Infection							
Respiratory Infection							
Other Infection							
Pressure Sores							
Pain							
Osteoporosis							
Broken Bones and/or Joint Dislocation							
Blood Clots, Deep Vein Thrombosis							
Overweight							
Other (Specify):							

The sensitivity and specificity of the Secondary Health-Complications Survey was examined using able bodied BMI cut offs (that is, BMI $\geqslant 24.9\,kg\,m^{-2}$ = overweight). Although SCI-specific cutoffs do exist now, they were not available when participants completed the Secondary Health Complications Survey. Thus, if participants were using a BMI cutoff as a reference in judging themselves as overweight, they would have used the able-bodied cutoffs. Accordingly, the sensitivity and specificity for the self-reported overweight measure were 45% (95% confidence interval (CI) = 29–62%) and 97% (95% CI = 83–100%), respectively (false positive rate = 3%, false negative rate = 55%). Analysis of variance revealed significant differences between true-positives and false-negatives for waist circumference (105.81 ± 2.31 vs 95.54 ± 2.13 cm), $F(1,35) = 10.73$, $P < 0.002$, and for BMI (31.98 ± 0.88 vs $26.74 \pm 8.15\,kg\,m^{-2}$), $F(1,35) = 18.95$, $P < 0.001$. These data suggest that perhaps particpants were using a BMI greater than the cutoff for overweight as a reference point when reporting their overweight status. Thus, we also calculated sensitivity and specificity using the BMI cutoff for obesity in the able-bodied population (BMI $\geqslant 30.0\,kg\,m^2$). Using the BMI cutoff for classifying a person as obese, the sensitivity and specificity for the self-reported overweight measure were 100% (95% CI = 65–100%) and 85% (95% CI = 73–93%), respectively (false positive rate = 12.6%, false negative rate = 0%).

Covariates

Although all demographic variables were examined as possible covariates, only age, years post injury, sex, mode of mobility and injury severity[26] were observed to be associated with certain secondary complications, adiposity and SWB measures. Thus, in all subsequent analyses, only the demographic variables that demonstrated a significant association with the independent or dependent variables were included as covariates. The covariates are listed in Table 3.

Overweight status and secondary complications

Data describing the prevalence and impact of secondary complications as a function of self-reported overweight

Table 3 Self-reported weight status, secondary complications and SWB

	Self-reported overweight		ANOVA
	Yes (n = 209)	*No (n = 483)*	
Overuse injuries[1,2,4] *n* (%)	115 (55.0%)**	213 (44.1%)	
Impact of overuse injuries[1,2] (mean ± s.d.)	1.77 ± 1.18***	1.27 ± 1.02	F(1,644) = 13.80
Fatigue[1,3] *n* (%)	138 (66.0%)**	263 (54.5%)	
Impact of fatigue[1] (mean ± s.d.)	1.93 ± .12**	1.54 ± 1.14	F(1,648) = 9.21
Spasticity[1,4] *n* (%)	151 (72.2%)	364 (75.4%)	
Impact of spasticity[1,4] (mean ± s.d.)	2.42 ± 1.10	2.45 ± 1.14	NS
UTI[1,4,5] *n* (%)	129 (61.7%)	286 (58.8%)	
Impact of UTI[1] (mean ± s.d.)	2.42 ± 1.12	2.63 ± .1.17	NS
Respiratory infection[1,3,4,5] *n* (%)	29 (13.9%)	63 (13.0%)	
Impact of respiratory infection[1,5] (mean ± s.d.)	2.95 ± 1.02	3.12 ± 1.04	NS
Other infection[1,5] *n* (%)	27 (12.9%)	67 (13.9%)	
Impact of other infection[1] (mean ± s.d.)	3.04 ± 1.25	2.85 ± 1.27	NS
Pressure sores[1,2,4] *n* (%)	61 (30.8%)	137 (28.4%)	
Impact of pressure sores[1,2] (mean ± s.d.)	2.78 ± 1.34	3.01 ± 1.30	NS
Osteoporosis[1,2,3,5], *n* (%)	54 (25.8%)	137 (28.4%)	
Impact of osteoporosis[1,2] (mean ± s.d.)	1.92 ± 1.18	1.60 ± .1.16	NS
Broken bones/dislocations[1] *n* (%)	22 (10.5%)	42 (8.7%)	
Impact of broken bones/dislocations[1] (mean ± s.d.)	3.38 ± 1.39	3.13 ± 1.33	NS
Blood clots/DVT[1] *n* (%)	5 (2.4%)	9 (1.9%)	
Impact of Blood clots/DVT[1] (mean ± s.d.)	2.41 ± 1.67	2.33 ± 1.69	NS
Pain[1,2] (mean ± s.d.)	5.83 ± 2.16*	5.43 ± 2.20	F(1,648) = 4.68
SWLS[1,2,4] (mean ± s.d.)	20.49 ± 8.51*	21.88 ± 8.34	F(1,669) = 3.91
PHQ[1,2] (mean ± s.d.)	5.30 ± 4.47**	4.06 ± 4.39	F(1,682) = 11.27

Abbreviations: ANOVA, analysis of variance; DVT, deep vein thrombosis; NS, non-significant; PHQ, Patient Health Questionnaire-9; SWB, subjective well-being; SWLS, Satisfaction with Life Scale; UTI, urinary tract infection; YPI, years post injury.
n (%), number and percent of individuals in each self-reported overweight category who indicated they experienced a secondary complication (for example, 66% of individuals who reported being overweight experienced fatigue, whereas only 54.5% of the individuals who reported not being overweight experienced fatigue). The superscript notation represents the demographics characteristics included in the model: 1, controlling for age; 2, controlling for YPI; 3, controlling for sex; 4, controlling for injury severity; 5, controlling for mobility class. Secondary complication impact measured on a five-point scale of 0 = none at all; 4 = very severe impact.
*$P \leqslant 0.05$.
**$P \leqslant 0.01$.
***$P \leqslant 0.001$.

status are included in Table 3. After controlling for relevant demographic covariates, the logistic regression models predicting overuse injuries and fatigue were significant, Hosmer and Lemeshow Tests $\geqslant 0.21$. Individuals who considered themselves overweight were more likely to report overuse injuries (odds ratio $(OR)_{adj} = 1.58$; 95% CI = 1.13–2.21, Wald statistic = 6.98, $P = 0.008$), and fatigue ($OR_{adj} = 1.65$; 95% CI = 1.18–2.33, Wald statistic = 8.35, $P = 0.004$) than individuals who did not consider themselves overweight. The impact of each complication was examined only for those individuals who reported having a particular complication. Analyses of variance also confirmed that individuals who considered themselves overweight reported an increase in the impact of overuse injuries and fatigue and significantly higher pain (P-values < 0.03) than individuals who did not consider themselves overweight. Self-reported overweight status was not related to any other secondary complications.

Overweight status and SWB
Data describing participants' SWB as a function of self-reported overweight status and SWB are presented in Table 3. ANOVAs confirmed that individuals who considered themselves overweight had significantly greater depressive symptoms, and lower satisfaction with life, than individuals who did not consider themselves overweight, P-values $\leqslant 0.05$.

Body mass index
Logistic regression revealed that BMI was only associated with spasticity (Hosmer & Lemeshow Test = 0.25, OR_{adj} 1.16; 95% CI = 1.00–1.34, Wald statistic = 3.84, $P = 0.05$), suggesting that individuals with a greater BMI were more likely to report spasticity. Partial correlations indicated that greater BMI was not associated with the impact of any secondary complication, life satisfaction or depressive symptoms (correlation coefficients ranged from −0.17 to 0.60, P-values > 0.05).

Discussion

In able-bodied individuals, being overweight has negative implications for both physical and psychosocial well-being.[27] However, there has been limited research examining the relationships between adiposity, secondary complications and SWB in individuals with SCI.[4] Our findings suggest that some secondary complications are more prevalent and have a greater impact among people who consider themselves overweight versus people who do not consider themselves to be overweight. Furthermore, people who considered themselves overweight reported lower SWB than individuals who do not report being overweight. In our discussion of these findings, it is important to be mindful of the measurement properties of the self-report measure used to determine overweight status, as well as the cross-sectional analyses. The measure seems to be most sensitive when identifying individuals who meet the able-bodied criteria for obesity rather than overweight. Thus our findings may be indicative of the relationship between obesity status and secondary complications rather than overweight status *per se*.

As hypothesized, individuals who perceived themselves to be overweight reported a greater prevalence and impact of overuse injuries, fatigue and pain than individuals who did not consider themselves overweight. Several complex factors likely underlie the relationship between overweight status and these secondary complications. One possible explanation is that among people with SCI, the upper limbs often support the body weight especially during activities of daily living, such as wheelchair propulsion and transferring. These activities of daily living place an increased strain on the upper limb joints and may explain the relationship between overweight status and overuse injuries, fatique and pain in this sample.[28] To gain a full understanding of the nature of these associations, further research examining the relationship between overweight status and specific types of pain, fatigue and overuse injuries in needed.

The findings also support the hypothesis that individuals who reported themselves to be overweight would concurrently report less favorable SWB than individuals who did not consider themselves overweight. Increased adiposity has been associated with poorer measures of SWB, including physical and psychological well-being in the able-bodied population.[29] We observed that individuals with SCI who considered themselves to be overweight reported less satisfaction with life and greater depressive symptoms than individuals who did not consider themselves to be overweight. One plausible explanation for these findings is that individuals with SCI who reported being overweight may have encountered greater limitations in accomplishing activities of daily living or community integration, therefore, becoming less satisfied with their life and experiencing more feelings of depression.[25] Indeed, increased adiposity has been shown to limit participation in activities of daily living in the able-bodied population.[30] In addition to examining community integration as a factor underlying the relationship between overweight status and SBW, other factors including pain and physical activity participation should be considered.

As hypothesized, objectively measured BMI was not a strong predictor of secondary complications or SWB. Of the 11 secondary complications examined, only spasticity was positively associated with BMI. This finding is contrary to previous research that has demonstrated that increased spasticity results in increased energy expenditure.[31] It also has been suggested that spasticity may promote a favorable body composition and muscle mass.[32] Accordingly, it may be that our findings are indicative of the inability of BMI to differentiate between fat- and fat-free mass.

Indeed, it has been suggested that BMI is a poor surrogate for adiposity especially in the SCI population.[2] It is for this reason in part that the other non-significant relationships between BMI and secondary complications were expected. Therefore, these findings may have implications for the use of BMI in clinical settings. Moreover, it has been suggested that objective measures of health status (that is, BMI) may not predict perceived health and well-being to the same extent as self-reported measures (self-reported overweight status).[14] The discrepancy between objective measures and self-reported measures of health status in predicating SWB may be because objective indicators of health are less important to the individual than subjective appraisals of health status.

Limitations

Although the study addressed the associations between adiposity, SCI-specific secondary complications and SWB, our study did have some limitations. First, the self-report measure of adiposity and secondary complications requires further validation. We indeed have supported the concurrent validity of the overweight component of the Secondary Health Complications Survey by demonstrating that individuals who reported themselves to be overweight had significantly higher BMI, waist circumference and body fat percentage than individuals who did not report being overweight. Furthermore, the finding that self-reported adiposity was not related to secondary complications, such as respiratory infections or urinary tract infections, which are unlikely to be associated with overweight, lends support to the discriminant validity of the measures. However, further rigorous validation of the other secondary complication components is needed. Second, the SHAPE-SCI subsample used in this study for the BMI-related analyses was small in comparison to the larger cohort. This smaller sample size possibly decreased statistical power and may have contributed to our failure to detect significant relationships between BMI, secondary complications and SWB. Third, the two-item pain subscale from the SF-36 is unable to differentiate between types of pain (neuropathic and musculoskeletal), as well as determine the specific location of pain. Future studies examining the relationships between adiposity and pain should use a measure that is able to predict both the type and location of pain. Fourth, there is also concern that individuals who report being overweight may also have a tendency to report other secondary complications without reservation. However, because self-reported adiposity was only associated with hypothesized secondary complications, it seems that individuals responded to the survey honestly. Fifth, due to the cross-sectional nature of the study, we are unable to determine causality or directionality of the examined relationships. For example, it is possible that being overweight leads to an increased likelihood of particular complications, or alternatively, particular complications may cause a more sedentary lifestyle, which in turn may increase the likelihood of becoming overweight. This design also precluded us from determining whether self-report of secondary complications was influenced by levels of depression or SWB.

Conclusion

Individuals with SCI who reported being overweight experienced less satisfaction with life and more overuse injuries, fatigue, pain and depression than those individuals with SCI, who did not consider themselves overweight. Further research is needed to identify the factors contributing to the association between overweight status, secondary complications and SWB.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgements

We thank the participants and Rebecca Bassett and Iwona Chudzik for their help with data collection. We also thank A Buchholz, MA McColl, P Potter and A Hicks for their contributions. The study was funded by the Canadian Institutes of Health Research (CIHR) #MOP-57778. Preparation of this paper was supported by a CIHR New Investigator Award, awarded to Kathleen Martin Ginis.

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