Correlation between food addiction and physical outcomes in low back pain among female adolescents

Correlación entre la adicción a la comida y los resultados físicos en el dolor lumbar entre mujeres adolescentes

Authors

Hajar M. Edris [1]
Essraa Amin Abd El-Hamid [2]
Enas Mohammed Atyia Esmail [3]
Nagwa Sayed Abdelwahed [1]
Amany Gomaa Atiaa [4]
Reem Hamdy Abdelhady [5]
Sally A. Asker [6]
Mennatallah M. Abdellatif [7]

[1] May University in Cairo (Egypt)
[2] Al Hayah University in Cairo (Egypt)
[3] Al al-Bayt University (Jordan)
[4] Sinai University (Egypt)
[5] Benha National University (Egypt)
[6] Cairo University (Egypt)
[7] Badr University in Cairo (Egypt)

Corresponding author:
Hajar M. Edris
Hajar.Mohammed@muc.edu.eg

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Abstract

Background: Low back pain is a prevalent musculoskeletal concern among adolescents and can be influenced by various lifestyle and physiological factors, including body weight and eating behaviors.
Purpose: To investigate the relationships between food addiction and physical outcomes related to low back pain among female adolescents.
Materials and Methods: A cross-sectional study design was used to recruit 200 obese female adolescents aged between 16 and 18 years. FA was assessed with the Yale Food Addiction Scale for Children and Adolescents. Pain intensity was assessed with a Visual Analogue Scale (VAS), pain pressure threshold was assessed with a Pressure Algometer, lumbar range of motion using a dual inclinometer, and functional disability was assessed with the Oswestry Disability Index.
Results: Greater FA scores were found to be positively correlated with pain outcomes, such as intensity of pain (r=0.563), functional disability(r=0.358), and were also negatively correlated with pain pressure threshold (r=−0.244) and all measures of range of motion (r=−0.784). Obesity (BMI) showed a positive correlation with pain intensity (r=0.712), functional impairment (r=0.493), and a strong inverse association with pain pressure threshold (r=−0.429) and range of motion of the lumbar spine (r=−0.791).
Conclusion: The study demonstrates that high food addiction and high BMI in female adolescents are significantly associated with greater pain intensity and functional disability, while inversely related to pain pressure threshold and lumbar ROM.

Keywords

Food addiction, low back pain, BMI, functional disability, range of motion.

Resumen

Antecedentes: El dolor lumbar es una preocupación musculoesquelética frecuente entre los adolescentes y puede verse influenciado por diversos factores fisiológicos y de estilo de vida, incluido el peso corporal y las conductas alimentarias.
Propósito: Investigar las relaciones entre la adicción a la comida y los resultados físicos relacionados con el dolor lumbar en adolescentes mujeres.
Materiales y métodos: Se utilizó un diseño de estudio transversal para reclutar a 200 adolescentes obesas de entre 16 y 18 años. La AF se evaluó con la Escala de Adicción a la Comida de Yale para Niños y Adolescentes. La intensidad del dolor se evaluó con una Escala Analógica Visual (EVA), el umbral de presión del dolor se evaluó con un Algómetro de Presión, el rango de movimiento lumbar con un inclinómetro dual y la discapacidad funcional se evaluó con el Índice de Discapacidad de Oswestry.
Resultados: Se encontró que las puntuaciones de FA más altas se correlacionaban positivamente con los resultados del dolor, como la intensidad del dolor (r=0,563), la discapacidad funcional (r = 0,358) y también se correlacionaban negativamente con el umbral de presión del dolor (r = -0,244) y todas las medidas de rango de movimiento (r = -0,784). La obesidad (IMC) mostró una correlación positiva con la intensidad del dolor (r = 0,712), el deterioro funcional (r = 0,493) y una fuerte asociación inversa con el umbral de presión del dolor (r = -0,429) y el rango de movimiento de la columna lumbar (r = -0,791).
Conclusión: El estudio demuestra que la alta adicción a la comida y el IMC alto en mujeres adolescentes se asocian significativamente con una mayor intensidad del dolor y discapacidad funcional, mientras que se relacionan inversamente con el umbral de presión del dolor y la ROM lumbar.

Palabras clave

Adicción a la comida, dolor lumbar, IMC, discapacidad funcional, rango de movimiento.

Introduction

The health problem of low back pain (LBP) may be present as early as adolescence. Reported figures indicate that the lifetime incidence of LBP ranged from 30% to 59% at ages 6 and 20, respectively. LBP is characterized by increasing prevalence from mid to late adolescence, and many adolescent LBP sufferers continue to experience it in adult life (Auvinen et al., 2008). One study conducted in Iran reported the period prevalence of LBP in children aged 11 to 14 as 15% with a yearly prevalence of 17.4%. Risks of LBP among children include the diversification of digital media platforms and watching television, psychological issues, sport participation, obesity, a positive family history of LBP, and generally low activity level (Kordi & Rostami, 2011).

LBP presently represents the most frequent source of disability worldwide. Its early onset in adolescence indicates that it is likely to become a long-term health issue. We have been following the LBP trajectory of participants in the Raine Study cohort from the age of 14 years into early adulthood. LBP is comorbid with other musculoskeletal pain, and our findings indicate that it is already prevalent in the population by the age of 14, increasing through adolescence and into early adulthood. While some adolescents may not be affected by LBP, for others, its repercussions include symptom alleviation, care-seeking, medication use, school and work absences, and a reduction in physical and functional activities. Together with other groups, in the Raine Study cohort, we followed the development of LBP from ages 14 to 22. We have also studied genetics, physical, psychosocial, as well as biological lifestyle factors and LBP in this population (O'Sullivan et al., 2017).

The negative impact of low back pain (LBP) appears to be more pronounced among adolescent girls. Interestingly, traditional biomechanical and structural factors such as school bag use, generalized joint hypermobility, scoliosis, individual variability in postural behavior, adaptation, and movement patterns., and back muscle endurance have not consistently demonstrated strong predictive value for LBP in adolescents. Contemporary literature increasingly adopts broader and more behaviorally oriented constructs, including screen use patterns, postural habits, school ergonomics, backpack-carrying behaviors, and levels of physical activity, rather than isolating single mechanical exposures. This reflects a clear paradigm shift in LBP research, emphasizing that pain is not primarily determined by the presence of external loads or posture alone, but rather by how these factors are integrated within daily behaviors and lifestyle patterns (O'Sullivan et al., 2017).

Egypt is an African nation whose teenagers have the highest obesity rate among the seven recently surveyed countries (Manyanga et al., 2014). Childhood obesity is not just an alarming global epidemic; it is an epidemic that has increased steeply in the past few decades, resulting in a drastic change in children's overall health (Ogden, 2004). Over the past few years, the obesity rate has stood out, which is directly related to the worrying attention on obesity-relevant dietary habits. Obesity represents a major public health challenge among children and adolescents, as it is linked to numerous medical, psychological, and social complications that may manifest and worsen from an early age of (Acosta et al., 2008).

Female adolescents suffer from LBP more than their male counterparts. The reported prevalence of these pain symptoms ranges between 30% and 50% in certain populations (Calvo-Muñoz et al., 2013; Aartun et al., 2014).

Food addiction (FA) is a relatively recent term that likens compulsive food cravings to the dependency observed in drug addiction (Ahmed & Sayed, 2017). Within the scientific community, the term food addiction has been used for quite some time now to describe an uncontrollable urge to eat. Nonetheless, systematic efforts to prove or disprove the concept were mostly absent during the twentieth century. This is now a media issue, as well as a scientific one (Meule et al., 2015).

Food addiction, more commonly referred to as eating addiction, is a subset of behavioral addiction characterized by the overconsumption of highly palatable foods, such as those that are calorically dense and rich in sugars and fats, which, despite the negative repercussions, evoke the reward system in human and animal brains (Hebebrand et al., 2014).

Researchers have suggested that the tendency to overeat and the occurrence of food addiction are closely associated with obesity, often reflected in elevated body mass index (BMI) levels; consequently, individuals who are overweight may display compulsive eating behaviors (Meule, 2012).

This relationship is likely mediated by an overactive appetite system combined with dysfunctional inhibitory control and increased craving, which result in excess calorie consumption and weight gain (Davis et al., 2011).

The phenomenon of food addiction has once again emerged in the context of obesity and chronic pain disorders. Defined by the inability to control food consumption, addiction to food is linked to obesity, increased systemic inflammation, and psychological distress, which may heighten pain and impede recovery in people with chronic low back pain (LBP) (Pursey et al., 2014; Adams et al., 2019). Moreover, people with food addiction may have low physical activity levels and poor adherence to rehabilitation, leading to worse functional status (Kim et al., 2017).

Method

Study Design

This cross-sectional study was carried out between March 2025 to August 2025. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki for research involving human participants. Ethics approval was granted by the ethical committee of the Cairo University Faculty of Physical Therapy (P.T.REC/012/005753) prior to the beginning of the study and by Pan African Clinical Trials Registry (PACTR) under the ID number (PACTR202507500871410).

Sample size calculation

A pilot study analysis involving 20 obese girls with low back pain was conducted to estimate the correlation between the Yale total score and low back pain measures. Yale scores demonstrated significant positive correlations with BMI (r = 0.89), flexion (r = 0.69), and right lateral rotation (r = 0.75). Based on these effect sizes, sample size estimates were calculated using G*Power version 3.1.9 (Heinrich-Heine-University, Düsseldorf, Germany). For effect sizes considered moderate to large (with r-values between 0.45 and 0.70), a sample size between 85 and 190 participants would be sufficient to provide 80% statistical power at a significance threshold of 0.05.Therefore, a final sample size of up to 200 participants is sufficient and provides adequate power to detect statistically meaningful correlations between Yale score and key low back pain parameters.

Participants

The study involved 200 patients who met the inclusion criteria: aged between 16 and 18 years, females only, and experiencing obesity and overweight. The participants in this study were selected at random from outpatient clinics, private and governmental secondary schools, governmental hospitals, and Nasaaem Clinics & Hospital. Exclusion criteria included scoliosis or kyphosis, Recent spinal surgery within the past 12 months, and Neurological disorders impacting motor function or sensation.

Outcome Measures

Measures for assessment

The assessment procedures involve digital scale to measure the weight, tape measurement to measure the height, waist circumference, hip circumference, and BMI calculator to measure Body Mass Index (BMI), Waist Hip Ratio (WHR), Yale Food Addiction Scale for Food Addiction (YFAS), Visual Analogue Scale (VAS) for pain intensity level, Pressure Algometer for Pain pressure threshold, Inclinometers for Lumbar Range of Motion (LROM) and Oswestry Disability Index (ODI) for Functional Disability of Lumbar.

A. Anthropometric assessment:

1. Digital scale to measure body weight

Place a weighing scale on a flat surface, ask the individual to stand barefoot at the center wearing minimal clothing, ensure they are breathing normally, and record the body weight in kilograms.

2. Use a tape measure to measure the height

Height is measured when the person is standing mildly, fully barefoot, with their head in an upright position so that their eyes look horizontally. Length is measured to the nearest centimeter.

3. BMI Calculator to measure Body Mass Index (BMI)

BMI is computed by dividing a person's weight in kilograms by their height in square meters.

4. Waist Circumference (WC):

Waist circumference should be measured at the level of the top of the iliac crest. Wrap the tape measure evenly around the abdomen, ensuring the lower edge aligns with the marked point. Use a cross-handed method to align the zero end of the tape with the reading side. Make sure the tape is horizontal and level across the abdomen. Pull the tape snugly enough to lie flat against the skin without compressing it. Record the measurement at the end of a normal exhalation, rounding to the nearest 0.5 cm. Waist circumference serves as a reliable indicator of both total and abdominal fat and is a valid measure of adiposity, with minimal impact from a person's height.

5. Waist-hip ratio (WHR)

A higher waist-to-hip ratio (WHR) suggests a greater accumulation of fat around the abdomen and is commonly used to assess body fat distribution. However, WHR can be affected by various other physical characteristics, and research indicates that it may not accurately reflect fat distribution in children. Despite this limitation, WHR is still commonly applied in studies involving pediatric and adolescent populations. According to the World Health Organization (WHO), abdominal obesity is defined as a WHR exceeding 0.90 in males and 0.85 in females.

B. Yale Food Addiction Scale for Food Addiction (YFAS):

The diagnosis of food addiction was assessed using the 25-item self-report survey: Yale Food Addiction Scale (YFAS) for Children and Adolescents. The survey was translated into Arabic, and the translation was pre-reviewed by three domain experts to assess its accuracy and relevance. Participants who described three or more symptoms alongside meeting the benchmark for clinically relevant harm or distress succumbed to food addiction.

The scale evaluates seven core criteria related to food addiction:

A) Tolerance (items 20 and 21);

B) Withdrawal symptoms (items 12, 13, and 14);

C) Consuming more food than intended or for longer durations (items 1, 2, and 3);

D) Multiple failed efforts to manage or curb eating behaviors (items 4, 22, 24, and 25);

E) Devoting a substantial amount of time to the procurement, consumption, or recuperation from the food intake (items 5, 6, and 7);

F) Social, professional, or leisure activities are being disregarded due to eating behavior (items 8, 9, 10, and 11); and

G) Continuing to eat despite awareness of physical or psychological harm (item 19).

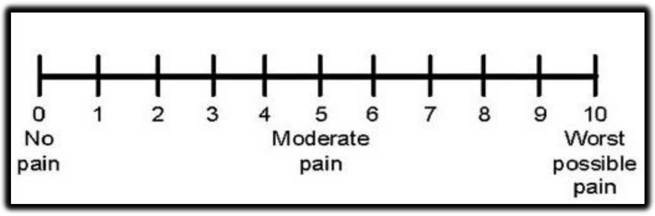
Moreover, items 15 and 16 evaluate clinically significant distress or any form of distress or impairment concerning eating issues, whilst items 17, 18, and 23 serve as preambles to other questions and, as such, do not form part of the scoring structure.

C. Low Back Pain Outcomes:

1. Pain intensity level measurement:

The intensity of lumbar pain was assessed both before and after treatment using the Visual Analog Scale (VAS). This scale consists of a line (either vertical or horizontal) measuring 10 cm in length. The endpoints indicate "no pain" and "worst pain" respectively. As shown in Figure 1 (Gould et al., 2001), each participant was asked to indicate the point on the line that best matched her pain level. The VAS has test-retest reliability and good validity between 0.95 and 0.97 (Kelly, 2001).

Figure 1. The visual analogue scale



2. Pain pressure threshold (PPT)

PPT was assessed via a pressure algometer both pre- and post-treatment. Assessment was conducted by Commander Algometer (JTECH Medical, Midvale, Utah, USA). While the subject lay in the prone position, the researcher marked the L3 vertebra bilaterally, 5 cm both laterally of the midline and over the paraspinal muscle with a skin pen, indicating where the measuring points would be. The subject was instructed to point at a location where "pain or discomfort" was experienced, at which point the measurement was stopped. Slowly, at right angles to the skin, a 1 cm^2 metal sensor probe of the algometer was placed over the marked point (Velasco-Roldán et al., 2018).

3. Measurement of lumbar range of motion (ROM)

The therapist assessed the lumbar range of motion (ROM) using a dual inclinometer. A dual inclinometer is an instrument that consists of two inclinometers and can measure lumbar ROM in all directions, which include: flexion, extension, side bending, and rotation.

4. Back functional disability index with the Oswestry disability index (ODI)

The ODI is a specialized scale designed to evaluate how lower back pain (LBP) affects a person's functioning on a day-to-day basis. It is comprised of a questionnaire containing 10 items, each with six options that range from 0 to 5. These options might include: the intensity of pain, personal care, lifting, ambulation, sitting, sleep, sexual activities (if relevant), and social participation. The outcomes and their results can be calculated effortlessly. It is well known that ODI is a valid and reliable questionnaire designed to assess disability pertaining to specific conditions (Fairbank & Pynsent, 2000). The score on the ODI results from the summed individual scores on the ten items. From the total score, the following grades of disability can be assigned: mildly or not disabled (0-20%), moderately disabled (21%-40%), severely disabled (41 to 60%), disabled and incapacitated (61 to 80%), and bed-bound (restricted to 81-100%). There is an Arabic validated version from ODI (Algarni et al., 2014).

Statistical Analysis

For Windows, version 25 SPSS software served as the platform for performing statistical analysis (SPSS, Inc., Chicago, IL). Quantitative data were described for demographic data, Yale total score, pain intensity, pressure threshold, function, and range of motion as the mean and standard deviation for the obese girls. Pearson's correlation coefficient was computed to assess the relation and direction of Yale's total score with pain intensity, pressure threshold, function, and range of motion. Also, to determine the relation and direction of BMI with Yale total score, and the other variables stated, a similar approach was taken. All statistical analyses were significant at the level of probability (P≤0.05).

Results

The clinical general characteristics of obese girls are presented in Table 1. A total of 200 obese girls participated in this study, and their ages ranged from 16.00 to 18.00 years with a mean age of 17.19 ±0.82years. The mean weight value was 80.66 ±10.53 kg, with a range from 58.00 to 113.00 kg. The mean value of height was 162.59 ±7.72 cm, with a range from 151.00 to 181.00 cm. The mean value of BMI was 30.43 ±2.64 kg/m2, with a range from 27.00 to 38.32 kg/m2. The mean value of waist circumference was 98.48 ±6.85 cm, with a range from 85.00 to 116.00 cm. The mean value of hip circumference was 124.22 ±8.90 cm, with a range from 102.00 to 147.00 cm. The mean value of the waist/hip ratio was 0.79 ±0.02, with a range from 0.74 to 0.91.

Table 1. Clinical general characteristics of obese girls

Variables	General characteristic values (n=200)		
	Mean ±SD	Minimum	Maximum
Age (years)	17.19 ±0.82	16.00	18.00
Weight (kg)	80.66 ±10.53	58.00	113.00
Height (cm)	162.59 ±7.72	151.00	181.00
BMI (kg/m2)	30.43 ±2.64	27.00	38.32
Waist circumference	98.48 ±6.85	85.00	116.00
Hip circumference	124.22 ±8.90	102.00	147.00
Waist/hip ratio	0.79 ±0.02	0.74	0.91

Data are expressed as mean ±standard deviation.

The descriptive statistics of food addiction and low back pain for obese girls are shown in Table 2. The mean value of Yale's total score was 10.44 ±5.07, with a range from 3.00 to 18.00. The mean value of pain intensity was 6.94 ±1.26, with a range from 5.00 to 9.00. The mean value of pressure threshold was 5.33 ±0.84, with a range from 4.00 to 8.00. The mean value of the function was 15.61 ±4.38, with a range from 8.00 to 28.00. The mean value of flexion was 31.38 ±4.90, with a range from 20.00 to 40.00. The mean value of extension was 10.79 ±2.98, with a range from 5.00 to 18.00. The mean value of right rotation was 1.98 ±0.82, with a range from 1.00 to 4.00. The mean value of left rotation was 1.88 ±0.97, with a range from 1.00 to 5.00. The mean value of right lateral rotation was 13.54 ±3.70, with a range from 8.00 to 22.00. The mean value of left lateral rotation was 13.67 ±4.30, with a range from 8.00 to 25.00.

Table 2. Descriptive statistics of food addiction and low back pain variables

Variables	Descriptive statistic values (n=200)		
	Mean ±SD	Minimum	Maximum
Yale total score	10.44 ±5.07	3.00	18.00
Pain intensity	6.94 ±1.26	5.00	9.00
Pressure threshold	5.33 ±0.84	4.00	8.00
Function	15.61 ±4.38	8.00	28.00
Flexion	31.38 ±4.90	20.00	40.00
Extension	10.79 ±2.98	5.00	18.00
Right rotation	1.98 ±0.82	1.00	4.00
Left rotation	1.88 ±0.97	1.00	5.00
Right lateral flexion	13.54 ±3.70	8.00	22.00
Left lateral flexion	13.67 ±4.30	8.00	25.00

Data are expressed as mean ±standard deviation.

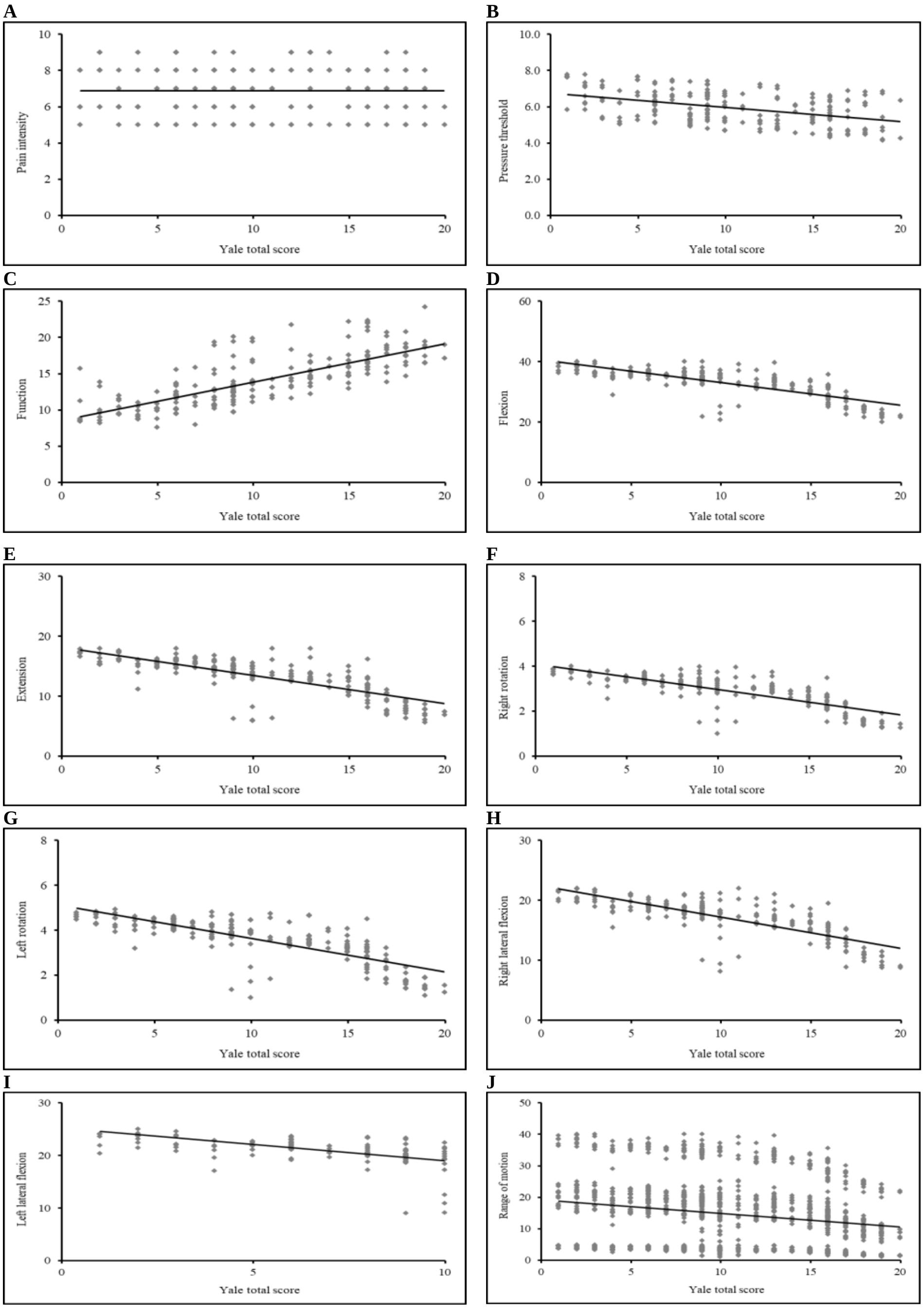
The bivariate Pearson correlation coefficients between Yale total score and low back pain variables are presented in Table 3. The results of these correlational analyses revealed there were significantly (P<0.05) positive strong relations between Yale total score and pain intensity (r=0.563; P=0.0001) and a positive moderate relation with function (r=0.358; P=0.0001). Moreover, a significant (P<0.05) negative weak relation between Yale total score and pressure threshold (r=-0.244; P=0.018). There were significantly (P<0.05) negative strong relations between Yale total score with flexion (r=-0.589; P=0.0001), extension (r=-0.580; P=0.0001), right rotation (r=-0.596; P=0.0001), left rotation (r=-0.583; P=0.0001), right lateral flexion (r=-0.684; P=0.0001), left lateral flexion (r=-0.682; P=0.0001), and range of motion (r=-0.784; P=0.0001). These negative and positive correlations mean that a change in the pain intensity, pressure threshold, function, and range of motion measurements is consistent with a change in the Yale total score in obese girls suffering from low back pain. Positive associations were observed between Yale total score and both pain intensity (Figure 1A) and functional disability (Figure 1C), indicating that higher levels of food addiction were related to higher pain intensity and increased functional impairment in obese female adolescents with low back pain. However, the direction of the ties between Yale total score with pressure threshold (Figure 1B), flexion (Figure 1D), extension (Figure 1E), right rotation (Figure 1F), left rotation (Figure 1G), right lateral flexion (Figure 1H), left lateral flexion (Figure 1I), range of motion (Figure 1J) revealed that by increase food addiction (Yale score), pressure threshold, and range of motions decreased (negative relations) in low back pain obese girls.

Table 3. Relations between the Yale total score and low back pain variables

Items	Yale total score	
	r-value	P-value
Pain intensity	0.563	0.0001*
Pressure threshold	-0.244	0.018*
Function	0.358	0.0001*
Flexion	-0.589	0.0001*
Extension	-0.580	0.0001*
Right rotation	-0.596	0.0001*
Left rotation	-0.583	0.0001*
Right lateral flexion	-0.684	0.0001*
Left lateral flexion	-0.682	0.0001*
Range of motion	-0.784	0.0001*

r-value: Pearson's correlation coefficient; Strong correlation (±0.50 to ±1); Moderate correlation (±0.30 to ±0.49); Low correlation (< ±0.29)
P-value: probability value *Significant: P>0.05.

Figure 2. Relations between Yale total score and low back pain variables (n=200).Scatter plots between Yale total score with pain intensity (A), pressure threshold (B),function (C),flexion (D),extension (E),right rotation (F),left rotation (G),right lateral flexion (H),left lateral flexion (I), and range of motion (J).



The bivariate Pearson correlation coefficients between BMI, food addiction, and low back pain variables are presented in Table 4. The results of these correlational analyses revealed there were significantly (P<0.05) positive strong relations between BMI with Yale total score (r=0.805; P=0.0001), pain intensity (r=0.712; P=0.0001), and function (r=0.493; P=0.0001). Moreover, a significant (P<0.05) negative moderate relation between BMI and pressure threshold (r=-0.429; P=0.0001). There were significantly (P<0.05) negative strong relations between BMI with flexion (r=-0.776; P=0.0001), extension (r=-0.774; P=0.0001), right rotation (r=-0.781; P=0.0001), left rotation (r=-0.778; P=0.0001), right lateral flexion (r=-0.878; P=0.0001), left lateral flexion (r=-0.854; P=0.0001), and range of motion (r=-0.791; P=0.0001). These positive and negative correlations indicate associations between BMI and pain-related and functional outcomes in obese female adolescents with low back pain. Higher BMI values were positively associated with higher pain intensity, higher Yale food addiction scores, and greater functional disability, as shown in Figures 1A, 1B, and 1D. In contrast, higher BMI values were negatively associated with pain pressure threshold and all measures of lumbar range of motion, including flexion (Figure 1E), extension (Figure 1F), right rotation (Figure 1G), left rotation (Figure 1H), right lateral flexion (Figure 1I), left lateral flexion (Figure 1J), and overall range of motion (Figure 1K), indicating lower values of these outcomes in participants with higher BMI.

Table 4. Relations between body mass index, food addiction, and low back pain variables

Items	Body mass index	
	r-value	P-value
Yale total score	0.805	0.0001*
Pain intensity	0.712	0.0001*
Pressure threshold	-0.429	0.0001*
Function	0.493	0.0001*
Flexion	-0.776	0.0001*
Extension	-0.774	0.0001*
Right rotation	-0.781	0.0001*
Left rotation	-0.778	0.0001*
Right lateral flexion	-0.878	0.0001*
Left lateral flexion	-0.854	0.0001*
Range of motion	-0.791	0.0001*

r-value: Pearson's correlation coefficient; Strong correlation (±0.50 to ±1); Moderate correlation (±0.30 to ±0.49); Low correlation (< ±0.29)
P-value: probability value *Significant: P>0.05.

Discussion

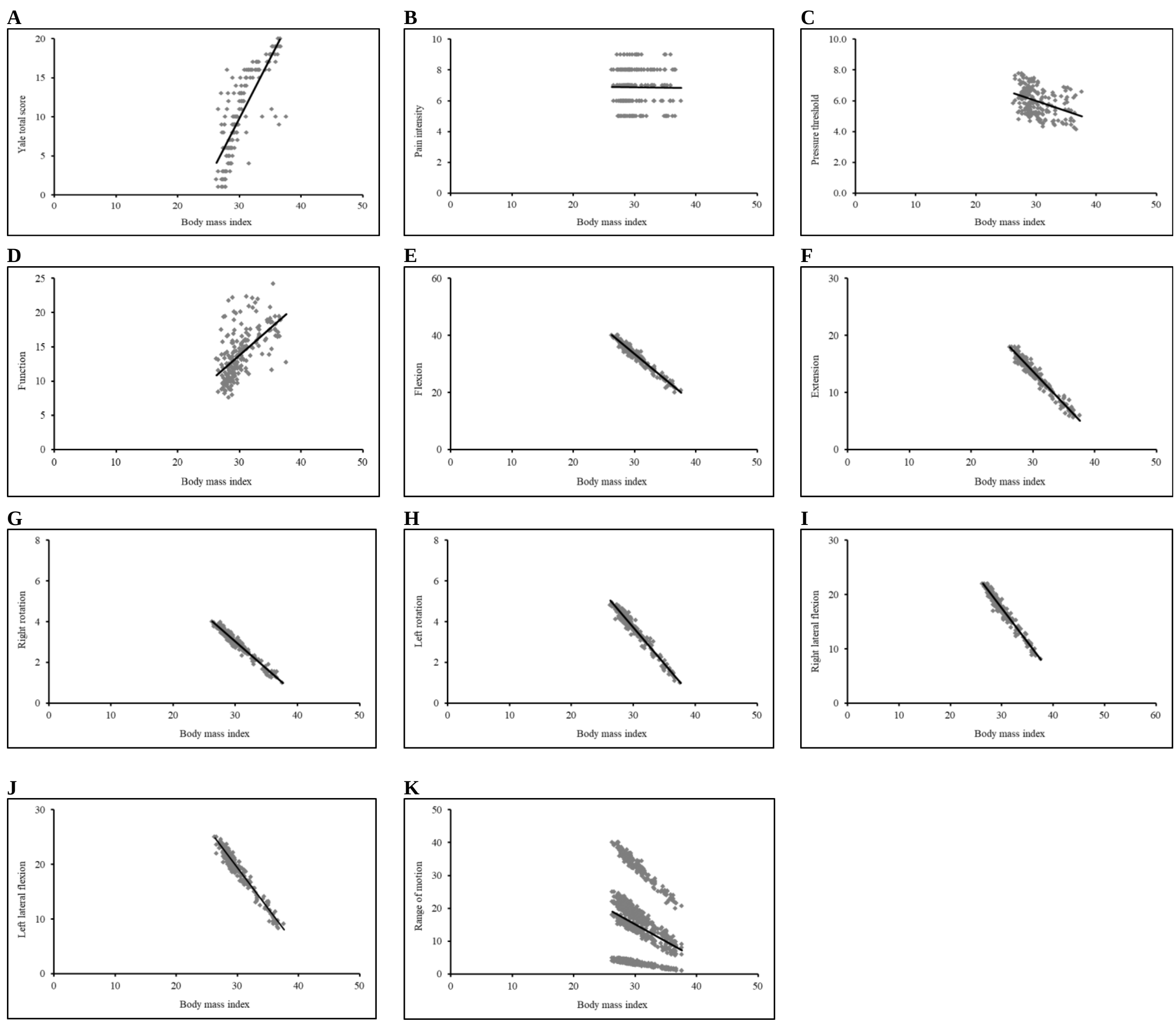
In recent decades, Adolescent obesity and overweight issues have seen a significant rise, raising concerns regarding their potential impact on musculoskeletal health. Although several studies have explored these conditions, few have examined their associations with pain outcomes during the later stages of adolescence. In the present study, which analyzed cross-sectional data from female adolescents aged 16 to 18 years, we identified significant positive associations between food addiction and low back pain outcomes. Similarly, body mass index (BMI) demonstrated positive correlations with most low back pain measures, with the exception of pressure pain threshold (PPT), which was inversely correlated with BMI. The findings relevant to this study add to the scarce literature examining the association of diet to weight and occurrence of musculoskeletal pain in this demographic is of interest.

Overweight and obesity may be risk factors for LBP in children and adolescents. The association between LBP and obesity appears to be stronger than with overweight (Garcia-Moreno et al., 2024).

Back pain is a relatively common condition in children. The relatively high FA prevalence found in children and adolescents is comparable with that in adults. Therefore, FA appears relevant to both pediatric and adult populations. Moreover, higher estimates of FA were observed among children and adolescents with overweight/obesity as compared with lean/normal-weight individuals (Yekaninejad et al., 2021).

A higher incidence of LBP is reported in females compared to males. Sex differences, along with the time of onset, may be related to the earlier age of puberty onset and growth spurt, and to the different distribution of adipose tissue and body composition. Females are more likely to be overweight during adolescence, with a peripheral adipose tissue distribution, while abdominal visceral fat accumulation is more common among males. According to a previous population-based prospective cohort study, overweight was associated with incident LBP rather than with persistent LBP in both sexes. In this study, a body mass index (BMI) between 7 and 16 years old was significantly associated with LBP in females at 18 years of age (Ambrosio et al., 2023).

Figure 3. Relations between body mass index, food addiction, and low back pain variables (n=200). Scatter plots between body mass index with Yale total score (A), pain intensity (B), pressure threshold (C), function (D),flexion (E), extension (F), right rotation (G, left rotation (H), right lateral flexion (I), left lateral flexion (J), and range of motion (K).



Particular attention should be paid to the mental well-being of overweight/obese children and adolescents with LBP. Psychosocial factors such as depression, social isolation, and anxiety are well-known risk factors for LBP as well as more commonly described in the young overweight and obese compared to normal-weight peers. In this subpopulation, LBP may contribute to further promoting physical inactivity through fear avoidance, pain catastrophizing, and kinesio-phobia mechanisms. Eventually, this may create a vicious cycle in which the lack of physical exercise leads to reduced social participation, lower calorie expenditure, poorer physical fitness, and ultimately worsening LBP with the risk of additional weight gain. This subset of patients should be promptly recognized to plan a personalized treatment strategy including cognitive behavioral therapy, dietary advice, and supervised physical exercise. In this regard, a recent study showed that the implementation of a regular physical exercise program ameliorated emotional well-being, self-perception, and self-concept in children with obesity and concurrent anxiety and depression Involving families and introducing appropriately defined school education programs would be of great value in improving the care of LBP. Interestingly, previous studies have demonstrated that Back School and postural education programs in school-aged children and adolescents resulted in healthier backpack use, better ergonomic knowledge, and lower self-reported LBP rates (Ambrosio et al., 2023).

LBP is a common condition in the pediatric age, especially in overweight and obese subjects. Considering the risk of persisting LBP into adulthood, as well as the detrimental consequences of excessive body weight, it is essential to plan adequate prevention and treatment strategies as early as during childhood. These mainly entail weight loss through diet optimization, promotion of an active lifestyle, and preservation of mental well-being (Ambrosio et al., 2023).

Our study identifies robust associations between food addiction (FA), BMI, and multiple LBP outcomes in female adolescents, including a strong positive correlation between FA and pain intensity (r = 0.563) and a significant negative correlation with lumbar range of motion (r = -0.784). These results suggest that the impact of obesity on LBP. Research indicates that obesity significantly impacts spinal mobility, specifically leading to reduced lumbar flexion, extension, and lateral flexion. While data on adolescents remain limited, current findings align with several adult studies suggesting that excess adipose tissue may physically obstruct vertebral intersegmental mobility. Although some inconsistencies exist regarding lumbar flexion specifically, there is a clear consensus that obesity limits range of motion in both the sagittal and frontal planes (Bayartai et al., 2022).

Crucially, this reduction in mobility is a known risk factor for the development and chronicity of low back pain. Prospective evidence suggests that restrictions in frontal plane movement, in particular, increase pain risk. Consequently, clinical strategies for pediatric and adolescent populations should prioritize weight management alongside specific exercises to promote lumbar flexibility to mitigate long-term musculoskeletal complications (Bayartai et al., 2022).

YFAS 2.0 ‘food addiction’ was met by nearly 8% of the population. There is a non-linear relationship between addictive-like eating and BMI, with the highest prevalence among underweight and obese persons. These findings suggest that ‘food addiction’ may be a contributor to overeating but may also reflect a distinct phenotype of problematic eating behavior not synonymous with obesity. Further, the elevated prevalence of YFAS 2.0 ‘food addiction’ among underweight individuals may reflect an overlap with eating disorders and warrants attention in future research (Meule, 2012).

Our results align with existing research indicating a significant correlation between food addiction and increased BMI (r = 0.805). Regarded to Pedram et al. (2013), There is a significant correlation between ‘food addiction’ and the severity of obesity in the general Newfoundland population. This finding appears to be robust as we were able to demonstrate this significant correlation throughout a number of analyses controlling for many confounding factors. Firstly, the clinical symptom counts of ‘food addiction’ was significantly correlated not only with BMI.

Furthermore, the significant negative correlation found between FA and pain pressure threshold (PPT) (r = -0.244, P = 0.018) points toward a state of central pain sensitization. Chronic overeating of processed, high-calorie foods may promote central obesity and metabolic dysregulation, which increases mechanical load on the spine while simultaneously leading to pain sensitization through inflammatory pathways. This sensitization is likely compounded by the psychological distress and lifestyle patterns often associated with food addiction, which can further worsen pain perception and reduce adherence to physical rehabilitation strategies (Pursey et al., 2014; Adams et al., 2019).

The moderate positive correlation between FA and functional disability (r = 0.358) also highlights important clinical implications. If addictive eating behaviors drive inactivity and poor functional status, traditional physical therapy alone may be insufficient for this demographic. These results underline the urgent need to assess for addictive eating behaviors among adolescents with LBP, as addressing food addiction through multidisciplinary strategies incorporating behavioral and nutritional interventions alongside physical therapy may be necessary to improve long-term pain and functional outcomes (Pursey et al., 2014; O’Sullivan et al., 2017).

Conclusions

The study demonstrates that high food addiction and high BMI in female adolescents are significantly associated with greater pain intensity and functional disability, while being inversely related to pain pressure threshold and lumbar ROM. These insights underscore the roles that both food addiction and heightened BMI play as contributing factors to adverse low back pain outcomes in this population.

Data Availability

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Consent to Participate

Informed consent was obtained from all individual participants included in the study, and for participants under 16 years, consent was obtained from their legal guardians.

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Conflict of interests

There is no declaration of conflict of interest.

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Authors' and translators' details:

Hajar M. Edris	Hajar.Mohammed@muc.edu.eg	Author
Essraa Amin Abd El-Hamid	Essraa.hl@gmail.com	Author
Enas Mohammed Atyia Esmail	enasmatyia13@gmail.com	Author
Nagwa Sayed Abdelwahed	nagwa.abelwahed@muc.edu.eg	Author
Amany Gomaa Atiaa	Amany.atia@su.edu.eg	Author
Reem Hamdy Abdelhady	Reem.hamdy478@gmail.com	Author
Sally A. Asker	Sallyasker2016@gmail.com	Author
Mennatallah M. Abdellatif	mannosh.mohammed4@gmail.com	Author