Artículo de Revisión / Review Article

Changes in weight and body composition among students after entering the university: a systematic review

Cambios en el peso y la composición corporal entre los estudiantes después de ingresar a la universidad: una revisión sistemática

ABSTRACT

Objective: Conduct a literature review to provide an estimate of changes in weight and body composition among university students and evaluate whether these changes are exclusive to the first year of academic life. **Methods:** Searches were performed in the PubMed/MEDLINE, Scopus, Web of Science, ScienceDirect, LILACS and SciELO databases for relevant articles published between 2007 and 2018. Only longitudinal studies involving concomitant evaluations of changes in weight and body composition were included. Two independent researchers performed the selection of the articles. **Results:** Eleven articles met the eligibility criteria and were included in the review. The tendency toward an increase in weight and body fat during academic life was confirmed, especially in the first year. Gains in weight and body fat in the freshman year of university were reported in all studies and ranged from 1.0 to 2.1 kg and 0.7 to 1.3%, respectively. Among the majority of students, the gain in body weight was the result of an increase in body fat. **Conclusion:** University students experience gains in weight and body fat during their academic lives, especially in the first year of university. **Keywords:** Body composition; Body fat; Freshman; University students; Weight gain.

RESUMEN

Objetivo: Realizar una revisión de la literatura para proporcionar una estimación de los cambios en el peso y la composición corporal entre los estudiantes universitarios y evaluar si estos cambios son exclusivos del primer año de la vida académica. **Métodos:** Se realizaron búsquedas en las bases de datos PubMed / MEDLINE, Scopus, Web of Science, ScienceDirect, LILACS y SciELO para artículos relevantes publicados entre 2007 y 2018. Solo se incluyeron estudios longitudinales que incluyeron evaluaciones concomitantes de cambios en el peso y la composición corporal. Dos investigadores independientes realizaron la selección de los artículos. **Resultados:** Once artículos cumplieron con los criterios de elegibilidad y se incluyeron en la revisión. La tendencia hacia un aumento en el peso y la grasa corporal durante la vida académica se confirmó, especialmente en el primer año. Las ganancias en peso y grasa corporal en

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el primer año de la universidad se informaron en todos los estudios y variaron de 1.0 a 2.1 kg y 0.7 a 1.3%, respectivamente. Entre la mayoría de los estudiantes, el aumento en el peso corporal fue el resultado de un aumento en la grasa corporal. **Conclusión:** Los estudiantes universitarios experimentan aumentos de peso y grasa corporal durante su vida académica, especialmente en el primer año de la universidad.

Palabras clave: Aumento de peso; Composición corporal; Estudiante de primer año; Estudiantes universitarios; Grasa corporal.

INTRODUCTION

The transition from high school to university is

considered a critical period for changes in body weight and the adoption of an unhealthy lifestyle among young adults¹. Entering a university is the first time in which many individuals are responsible for their own housing, food and the management of finances. The inability to perform these tasks, together with the lifestyle adopted in the academic context (the omission of meals, consumption of fast food and nutritionally unbalanced meals, greater alcohol intake and a reduction in the practice of physical activity) seem to be conditioning factors for weight gain in this group^{1,2}.

Considering this transition time, the term “freshman 15” emerged in the United States and Canada, which is based on the belief that university students gain 15 pounds (6.8 kg) in the first year of university^{3,4}. This topic has been studied for a number of years. In a literature review, Crombie et al.⁵ concluded that the mean increase in weight in the first year is lower than that suggested by the term “freshman 15” and is actually between 4.4 to 6.6 pounds (two to three kg).

Excess weight and weight gain are related to an increased risk of the development of chronic non-communicable diseases⁶. However, limiting the investigation of changes in body weight or the body mass index (BMI) may be insufficient for a reliable analysis of one’s nutritional status. The analysis of body weight reveals the short-term effects of changes in body components⁷ and BMI does not distinguish between fat mass and lean mass, which can lead to an inadequate estimation of obesity^{8,9}. It is therefore essential to evaluate the changes that occur in body composition.

Few studies have investigated changes in weight in the first year of university life and fewer still have evaluated changes in the body composition of freshman university students. Thus, the aim of the present study was to synthesize information through a systematic review of the literature and provide an estimate of changes in weight and body composition in university students during their years of academic life.

MATERIALS AND METHODS

The PubMed/MEDLINE, Scopus, Web of Science, ScienceDirect, LILACS and SciELO databases were searched for relevant articles published between 2007 and 2018 using the following search terms: weight gain, body composition, body fat, freshman, college students, and young adult. The Boolean operators and, or and not were used to combine terms during the search for articles.

Two researchers performed the identification and selection of the articles considering the following inclusion criteria: original articles published in English, Spanish or Portuguese between 2007 and 2018 using data from longitudinal studies involving university students with concomitant evaluation of changes in weight and body composition during academic life. Review articles, cross-sectional studies, case-control studies and clinical trials were excluded. Articles identified in more than one database were counted once.

Two researchers appraised the methodological quality of the studies based on the following items: clarity and

adequacy of the description of the sampling process; sample randomization; specification of inclusion and exclusion criteria; description of dropouts; and appropriate presentation of outcomes. In cases of a divergence of opinion between the researchers, the text in question was submitted to further analysis and discussion until a consensus was reached.

RESULTS

The database search led to the retrieval of 245 articles. After the removal of duplicates and an analysis of the titles and abstracts, 42 articles were pre-selected for full-text analysis. Following discerning evaluations based on the eligibility criteria, 11 articles were included in the present review (Figure 1).

The studies were conducted in North America ($n=9$) and Europe ($n=2$). Table 1 displays the main characteristics of the articles (author, year of publication, study setting, sample size, cohort period, objectives, study protocol and main variables analyzed). The first four studies selected were from the same research group and involved the same sample at baseline, differing only with regard to follow-up time (one, two, three and four years)^{10,11,12,13}. Likewise, two other studies involved the follow up of another cohort – one for one year and the other for two years^{4,15}. Methodological similarities were found among the studies with regard to the objectives and main variables analyzed, with differences mainly related to the follow-up period.

Table 2 offers a summary of the main outcomes and conclusions found in the studies selected. Gropper et al.^{10,11,12,13} investigated changes in weight and body composition among American university students during four years of academic life. During the first and second years, gains were found in weight (1.13 kg and 0.77 kg, respectively) and BMI (0.3 kg/m² and 0.3 kg/m², respectively), with no statistically significant differences between years. However, the gain in body fat was 1.5 kg in the first year, differing significantly from the gain found in the second year (0.3 kg). With regard to lean mass, a loss was found in the first year (-0.4 kg) and a gain in the second (0.5 kg); this difference was statistically significant^{10,11}.

Significant gains were found in weight (2.1 ± 4.7 kg), BMI (0.7 ± 1.6 kg/m²), percentage of body fat ($2.7 \pm 3.3\%$) and absolute body fat (2.3 ± 3.5 kg) in the first three years. All gains were higher in the first year, but the difference in comparison to the two following years was only statistically significant with regard to body fat. Among the students evaluated, 70% gained weight over the three-year period. The number of women with more than 30% body fat increased twofold and the number of men with more than 20% body fat increased fivefold. At the beginning of the cohort, the frequencies of underweight, ideal weight and excess weight were 5%, 79% and 15%, respectively. At the end of the third year, these figures were 5%, 70% and 24%, respectively¹².

Significant gains were found in weight (3.0 kg), BMI (1.0 kg/m²), percentage of body fat (3.6%) and absolute body

Figure 1. Flowchart of article selection process for present systematic review.

fat (3.2 kg) in the four academic years. Approximately 70% of the participants gained weight (mean: 5.3 kg) and the frequency of participants classified as overweight increased from 15 to 31%. The number of women and men with ≥ 30 and 20% body fat, respectively, increased from n= 14 to n= 26¹³.

At the University of Oklahoma in the United States, Hull et al.¹⁴ investigated the effect of vacation after the first

year on the weight and body composition of the students. In this cohort, the authors also evaluated changes in weight and body composition among women during their freshman and sophomore years¹⁵. Body weight increased 1.3 kg during the first academic year and 0.1 kg during summer vacation. BMI increased between the first two measurements (beginning and end of first year) and was unaltered between the second two measurements (end of first year and end of

Table 1. Characteristics of selected studies published between 2007 and 2018.

Author, year of publication and country	Sample/Period of cohort	Objective of study	Study protocol	Main variables analyzed
Gropper et al., 2010 USA	Initial: 240 (2007) Final: 205 (2008)	Evaluate changes in weight and body composition among freshman students during first year of university.	Evaluations on 3 occasions: beginning, middle and end of first year.	Weight, body mass index, body fat, lean mass and waist circumference.
Gropper et al., 2011 USA	Initial: 240 (2007) Final: 120 (2009)	Evaluate changes in weight and body composition among male and female students in first two years of university.	Evaluations on 3 occasions: beginning of first year and end of first and second years.	Weight, body mass index, body fat, lean mass and waist circumference.
Gropper et al., 2012 USA	Initial: 240 (2007) Final: 114 (2010)	Evaluate differences in weight, BMI, body fat, lean mass and waist circumference in male and female students in first three years of university.	Evaluations on 4 occasions: beginning of first year and annually until end of third year.	Weight, body mass index, body fat, lean mass and waist circumference.
Gropper et al., 2012 USA	Initial: 240 (2007) Final: 131 (2011)	Evaluate changes in weight, BMI and body composition among male and female students in first four years of university.	Evaluations on 5 occasions: beginning of first year and annually until end of fourth year.	Weight, body mass index, body fat, lean mass and waist circumference.
Hull et al., 2007 USA	Initial: 171 (2004) Final: 69 (2005)	Compare changes in weight and body composition in female university students during first year and after summer vacation.	Evaluations on 3 occasions: beginning and end of first year and after summer vacation.	Weight, body mass index, body fat and lean mass.
Hull et al., 2007 USA	Initial: 171 (2004) Final: 48 (2006)	Investigate changes in weight and body composition in women in second year of university and factors that influenced changes.	Evaluations on 4 occasions: beginning and end of first and second years.	Weight, body mass index, body fat and lean mass.
Jung et al., 2008 CANADA	Initial: 133 (2002) Final: 101 (2003)	Evaluate eating and physical activity patterns and associations with changes in weight among women in first year of university.	Evaluations on 2 occasions: beginning of first year and after 12 months.	Weight, body mass index and body fat.
Misfud et al., 2009 CANADA	Initial: 33 (2006) Final: 29 (2007)	Examine effects of pre-university adiposity and physical fitness on changes in body weight and adiposity in first year of university.	Evaluations on 3 occasions: beginning, middle and end of first semester.	Weight, body mass index, body fat, absolute value and lean mass.
Deliens et al., 2013 BELGIUM	Initial: 101 (2011) Final: 101 (2012)	Evaluate changes in weight, BMI, body composition and waist circumference in first semester among university students.	Evaluations on 2 occasions: beginning of first and second semesters.	Weight, body mass index, body fat and lean mass.
Hootman et al., 2017 USA	Initial: 264 (2015) Final: 172(2015)	Investigate predictors of weight gain in freshman university students.	Evaluations on 3 occasions: beginning, middle and end of first year.	Weight, body mass index and body fat.
Keska et al., 2018 POLAND	Initial: 87 (2008) Final: 61 (2009)	Determine the main health-related anthropometric and metabolic variables in young, physically active male university students during first year at college.	Evaluations on 2 occasions: beginning of first and second years.	Weight, body mass index, body fat and lean mass.

vacation). Lean mass increased significantly during the first school year (0.5 kg), but diminished 1.1 kg during vacation. Higher increases in the percentages of fat mass and lean mass occurred during vacation compared to the first year¹⁴. Between the beginning and end of the second year, no significant differences were found regarding body weight (60.4 versus 60.6 kg) or absolute body fat (19.3 versus 18.7

kg). A significant reduction was found in the percentage of body fat (31.9 versus 30.9%) and a significant increase was found in absolute lean mass (37.7 versus 38.4 kg). The change in absolute weight was higher in the first year compared to the second year (1.2 and 0.2 kg, respectively) and reductions in body fat occurred between the first and second years (0.7 and -1.0%; 0.8 and -0.6 kg, respectively)¹⁵.

Table 2. Main outcomes of studies selected for present review.

Author, year of publication and country	Main outcomes	Main conclusions
Gropper et al., 2010 USA	Gains in first year: Weight (kg) = 1.13; BMI (kg/m ²) = 0.3; Body fat (%) = 1.9; Body fat (kg) = 1.5; lean mass (%) = -1.9; Lean mass (kg) = -0.4	Weight gain among freshmen is associated with increase in body fat and waist circumference, which could be problematic if the tendency continues throughout university.
Gropper et al., 2011 USA	Gains in first and second years: Weight (kg) = 1.13 and 0.77; BMI (kg/m ²) = 0.3 and; 0.3 Body fat (%) = 1.9 and 0.0; Body fat (kg) = 1.5 and 0.27*; Lean mass (%) = -1.9 and 0.0*; Lean mass (kg) = -0.4 and 0.5*	First year was characterized by an unhealthy change in body composition. This change was less evident in second year.
Gropper et al., 2012 USA	Gains in first, second and third years Weight (kg) = 1.2 ^a , 0.5 ^a and 0.6 ^a ; BMI (kg/m ²) = 0.4 ^a , 0.1 ^a and 0.2 ^a ; Body fat % = 1.6 ^a , -0.1 ^b and 0 ^{a,c} ; body fat (kg) = 1.4 ^a , 0.0 ^b , 0.7 ^{a,b} ; Lean mass (kg) = -0.2 ^a , 0.4 ^a and -0.2 ^a . Different letters = statistically significant difference.	Gains in weight gain and fat mass, especially if maintained during last academic year, could contribute to an increase in the prevalence of obesity in this population in adulthood.
Gropper et al., 2012 USA	Total gains in four years: Weight (kg)* = 3.0; BMI (kg/m ²)* = 1.0; body fat (%) = 3.6; absolute fat mass (kg)* = 3.2. Increase in frequency of excess weight and body fat: 18 to 31% and 10.8 to 19.8%, respectively. * significant difference between measurements in first and fourth years.	Increase in frequency of obesity and obesity with normal weight suggest the need for health promotion strategies for university students.
Hull et al., 2007 USA	Gains in first year and after summer vacation of first year: Weight (kg) = 1.3 and 0.1*; BMI (kg/m ²) = 0.8 and 0.2; body fat (%) = 0.9 and 1.7; body fat (kg) = 1.0 and 0.9 and lean mass (kg) = 0.5 and 1.1*. * significant difference between gain in first year and gain after summer vacation.	Unfavorable changes between first academic year and summer vacation suggest the need to promote healthier lifestyle before students leave campus for vacation.
Hull et al., 2007 USA	Changes in first and second years: Weight (kg) = 1.2 and 0.2*; body fat (%) = 0.7 and -1.0; body fat (kg) = 0.8 and -0.6*; lean mass (kg) = 0.5 and 0.7 Changes between beginning and end of second year: Weight (kg) = 60.4 and 60.6 kg; body fat (kg) = 19.3 and 18.7; body fat (%) = 31.9 and 30.9*; lean mass (kg) = 37.7 and 38.4* * significant difference.	No change in body weight was observed in second year. However, an increase in lean mass accompanied by a reduction in fat mass (kg) resulted in a reduction in the percentage of body fat.
Jung et al., 2008 CANADA	Gains in first semester: Weight (kg) = 1.4; BMI (kg/m ²) = 0.5; body fat (%) = 0.6	Reduction in physical activity seems to have been the defining characteristic of weight gain in freshmen.
Misfud et al., 2009 CANADA	Gains in first semester: Weight (kg) = 1.4; waist circumference (cm) = 2.9; body fat (%) = 1.9; body fat (kg) = 1.8. Gains at end of first year: Weight (kg) = 1.9; waist circumference (cm) = 2.7; body fat (%) = 3.1; body fat (kg) = 2.6	Less pre-university adiposity is associated with greater changes in adiposity and body weight during first academic year.
Deliens et al., 2013 BELGIUM	Variables at beginning and end of semester: Weight (kg) = 63.1 and 64.1*; BMI (kg/m ²) = 21.8 and 22.1*; body fat (%) = 21.7 and 22.5*; body fat (kg) = 13.7 and 14.5*; lean mass (kg) = 49.4 and 49.6 * significant difference.	First semester at university is critical period for weight gain and body fat.
Hootman et al., 2017 USA	Gains in first year: Weight (kg) = 2.1; body fat (%) = 1.6; mean change in weight (kg) = +2.3 ♂ and +2.0 ♀; mean gain in fat (%) = +1.3 ♂ and +0.7 ♀	Weight gain among freshmen is common and reflects an increase in adiposity. A lower percentage of fat was a predictor of greater weight gain in both sexes.
Keska et al., 2018 POLAND	Variables at beginning and end of first year: Weight (kg) = 76.9 and 78.1*; BMI (kg/m ²) = 23.5 and 23.8; body fat (%) = 11.9 and 11.6; body fat (kg) = 9.4 and 9.3; lean mass (kg) = 67.5 and 68.9* * significance difference.	Gain in body weight was mainly due to increase in lean mass.

Jung et al.¹⁶ evaluated female university students throughout their freshman year and found gains in weight and body fat of 1.4 kg and 0.6%, respectively. Approximately 66% of the women gained weight (3.42 ± 2.72 kg). Among the participants who lost weight throughout the first year, a significant reduction in body fat was found, suggesting that the kilograms lost came from the excess of fat. Moreover, the students who gained weight had a significant increase in the percentage of body fat.

Misfud et al.¹⁷ followed up 33 university students during their freshman year with the aim of examining the effects of pre-university adiposity and physical fitness on changes in weight and body fat. In the first semester, significant increases in weight (1.4 kg), waist circumference (WC) (2.9 cm), percentage of body fat (1.9%) and absolute body fat (1.8 kg) were found among the men, but not the women. Likewise, significant increases in body weight (1.9 kg), BMI (0.6 kg/m^2), WC (2.7 cm), percentage of body fat (3.1%) and absolute body fat (2.6 kg) were found among the men at the end of the year.

Changes in weight, BMI and body composition were evaluated in Belgian students during the first semester. After 20 weeks at the university, 68.3% of the students gained weight and 66.3% exhibited an increase in BMI. Mean weight gain was 1.0 kg, most of which was an increase in body fat (0.8 kg). BMI and body fat (kg and %) also increased significantly. At baseline, 7.9% of the participants were underweight, 78.2% had a BMI in the ideal range, 12.9% were classified as overweight and 1.0% was classified as obese. After 20 weeks, these figures were 5.0%, 75.2%, 17.8% and 2.0%, respectively. Among the group of students with an increase in BMI ($n = 67$), the mean increase in body weight was 2.0 kg. Moreover, significant increases in percentage of body fat (1.5%), absolute body fat (1.4 kg) and absolute lean mass kg (0.6 kg) were found in this group¹⁸.

Hootman et al.¹⁹ evaluated weight gain among freshmen in the northeast region of the United States and found that 75% of the students gain more than 0.5 kg at the end of the first year. Among those with weight gain, the increase in weight was 5.6% and the increase in body fat was 1.6%. Mean weight gain throughout the year was 2.1 ± 3.0 kg (2.3 ± 3.2 kg among the men and 2.0 ± 2.9 kg among the women). The mean gain in body fat was $1.0 \pm 1.9\%$ ($1.3 \pm 1.6\%$ among the men and $0.7 \pm 2.2\%$ among the women). Among 89% of the participants who gained weight, the increase in the percentage of body fat represented approximately half of the total weight gain of these students.

In a study conducted in Poland, Keska et al.²⁰ evaluated changes in health-related anthropometric and metabolic variables in young, physically active male students in the first year of university. The gain in weight was 1.2 kg and resulted from a significant increase in lean weight ($r = 0.886$) in the majority.

DISCUSSION

Excess weight is one of the major public health

problems facing modern society and weight gain among university students is well-documented in the international literature^{1,21,22,23}. However, few studies have addressed the changes in body composition that occur after individuals enter the university.

The analysis of the studies selected for the present review confirms the tendency toward an increase in body weight during academic life. Weight gain in the first year was found in all studies, ranging from 1.0 to 2.1 kg. These figures are in agreement with data described in other findings in the literature^{9,24,25,26} and demonstrate that, for the majority of university students, the “freshman 15” appears to be somewhat of a myth. According to the studies analyzed, an important gain in body weight occurs in the first year of the university, but to a much lesser extent. In a meta-analysis, Vandeboucouer et al.²⁷ sought to update the literature on the concept of the “freshman 15” and evaluated 32 studies with follow-up periods ranging from six weeks to months. The authors found that the students gained an average of 1.36 kg (three lbs) (95% CI: 1.15 to 1.57 kg). Nearly two-thirds (60.9%) of the students gained weight and the average among these students was 3.38 kg (7.5 pounds) (95% CI: 2.84 to 3.92 kg). Only one in every ten students evaluated gained 6.8 kg (15 lbs), which represents the “freshman 15”.

The analysis of the studies that investigated the evolution in body weight beyond the first year of the university^{11,12,13,14,15} revealed smaller weight gains in the subsequent years. However, no possible explanations for this phenomenon were given. Perhaps this occurs because the students are better adapted to academic life after the first year, which reduces the impact of the initial stress. Despite this deceleration in weight gain, the behavior established during the years at the university can contribute to weight gain throughout one's life and, consequently, the development of obesity and other chronic diseases^{28,29}.

Grooper et al.¹³ evaluated changes in weight throughout the last year of the university (four-year period) and found a total weight gain of 3.0 ± 5.0 kg. Racette et al.²² and Pope et al.³⁰ also evaluated changes in body weight in this period and found gains of 2.5 kg and 4.38 kg, respectively. These figures are considered high, as the World Health Organization suggests avoiding weight gains greater than 5 kg throughout all of adulthood³¹.

The influence of sex on changes in weight and body composition during academic life was evaluated in seven of the 11 studies analyzed, all of which found greater gains in weight and/or body fat among the men^{10,11,12,13,17,18,19}. However, these studies did not discuss the possible reasons for these findings. Other studies suggest the greater consumption of alcohol often observed in males during academic life as a possible cause^{3,32,33}. It should also be pointed out that the evaluation of changes in weight and BMI alone is not indicated for this age group, as much of the weight gain, especially among men, may reflect gains in lean mass. According to Keska et al.²⁰ an assessment based merely on the BMI may mask one's actual nutritional status³⁴.

However, an analysis of the studies that evaluated body composition according to sex revealed that weight gain among the men was the result of gains in fat mass.

Changes in body weight alone do not necessarily indicate an increased risk of chronic non-communicable disease. Although BMI is associated with body composition measures and the risk of chronic diseases, the ideal situation would be to evaluate changes in weight accompanied by an analysis of body fat and lean mass percentage. Undesirable changes in body composition, such as a loss of lean mass and gain in body fat, especially abdominal fat, predispose individuals to a greater risk of chronic diseases^{5,9}.

Among the 11 studies included in the present review, seven employed electrical bioimpedance analysis^{10,11,12,13,16,18} and four employed dual X-ray absorptiometry^{14,15,17,19,20} to determine the percentage and/or amount of body fat and lean mass. The analysis of these studies suggests that weight gains, which were mainly seen in the first year, were linked to gains in body fat. During the first year of university, gains in body fat ranged from 0.7 to 1.3%, with only one of the studies reporting a higher figure (3.1%). In a systematic review and meta-analysis investigating changes in weight and the percentage of body fat (%BF) during college, Fedewa et al.³⁵ found an increase of 1.55 kg in body weight and 1.17% in %BF (95% CI: 0.7 to 1.6%). According to the authors, the change in body weight during the first year is significantly lower than the total of the subsequent years.

Excess body fat is associated with an increase in morbidity and mortality rates among adults due to the fact that it is a triggering factor for metabolic disorders, such as cardiovascular disease, dyslipidemia, diabetes, diminished respiratory capacity and even cancer^{36,37,38,39}. Adolescence and the transition to adulthood, which corresponds to the period of university life, are crucial moments with regard to the establishment of life habits. In this phase, the influence of the media and surrounding factors can outweigh the influence of parents and family, especially with regard to eating habits⁴⁰. Therefore, gains in body fat among adolescents and young adults are a cause for concern and merit attention. In addition, such gains increase the probability of becoming obese in adulthood and beyond^{41,42}.

The findings described by Misfud et al.¹⁷ and Hottman et al.¹⁹ regarding changes in weight and body composition among university student merit particular attention. These researchers found that the students with less body fat at baseline were those that experienced the greatest gains during the school year. According to Misfud et al.¹⁷ if one assumes that the students who began university with a higher amount of body fat already had a greater previous consumption of energy-dense foods and were more sedentary, one could speculate that the transition to an obesogenic environment, such as the university, would have less of an impact on the energy balance in this group.

CONCLUSION

The analysis of the studies included in the present review

demonstrate the following: university students experience gains in weight and body fat throughout academic life, especially in the freshman year; weight gain in the first year was lower than that suggested by the belief in the "freshman 15"; for the majority of students, gains in weight were the result of gains in body fat.

Limitations. Cohort studies that perform concomitant evaluations of weight and body composition in university students are scarce. After the application of the eligibility criteria and quality appraisal, the majority of studies only portrayed the situation of North American students, with some of the studies from the same research group and using the same sample at baseline. These factors pose limitations in terms of drawing more consistent conclusions regarding this issue and render comparisons with university populations from other continents impossible.

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