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Paweł SZKUDLAREK*, Dawid KOŹLENIA**

IMPACT OF A NEW YEAR BREAK IN PHYSICAL ACTIVITY ON BODY COMPOSITION IN PHYSICALLY ACTIVE OLDER WOMEN: A RETROSPECTIVE OBSERVATIONAL PILOT STUDY

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Wpływ przerwy noworocznej w aktywności fizycznej na skład ciała u aktywnie żyjących starszych kobiet: pilotażowe badanie retrospektywne

Streszczenie

Regularna aktywność fizyczna jest kluczowa dla utrzymania zdrowia w każdym okresie życia. Celem tego badania była ocena wpływu przerwy w regularnej aktywności fizycznej w okresie przerwy noworocznej (NYB, 14 dni) na masę ciała i jej składniki u fizycznie aktywnych kobiet powyżej 60. roku życia. Próba badawcza obejmowała 26 kobiet, z których 12 nie miało przerwy w aktywności fizycznej (grupa ciągłej aktywności, CAG), a 14 przerwało aktywność podczas przerwy noworocznej (grupa przerwy, BG). Parametry mierzone metodą bioimpedancji obejmowały masę ciała, procent tłuszczu (BF%) oraz wskaźnik masy ciała (BMI), obliczono także wskaźnik masy tłuszczowej (FMI). Dwuczynnikowa analiza wariancji (ANOVA) w modelu mieszanym ujawniła istotne interakcje między warunkiem NYB a czasem dla BMI, BF% i FMI ($P < 0,05$). Wyniki te sugerują, że zmiany tych parametrów składu ciała w czasie były zależne od warunku NYB, a kobiety, które zaprzestały aktywności fizycznej, doświadczały istotnego wzrostu BMI, procentu tłuszczu i masy tłuszczowej, co potwierdziły testy post-hoc ($P < 0,05$). Natomiast kobiety, które kontynuowały regularną aktywność fizyczną, nie wykazywały istotnych zmian w składzie ciała ($P > 0,05$). Wyniki te potwierdzają znaczenie utrzymania regularnej aktywności fizycznej w celu zmniejszenia negatywnych zmian w składzie ciała u starszych kobiet.

Słowa kluczowe: kobiety, osoby starsze, tkanka tłuszczowa, skład masy ciała aktywność fizyczna.

* https://orcid.org/0009-0004-9742-9707; MSc; Unit of Biostructure, Faculty of Physical Education and Sport, Wroclaw University of Health and Sport Sciences, Wroclaw, Poland

** https://orcid.org/0000-0002-5304-7879; PhD; Unit of Biostructure, Faculty of Physical Education and Sport, Wroclaw University of Health and Sport Sciences, Wroclaw, Poland; e-mail: dawid.kozlenia@awf.wroc.pl (corresponding author)

Abstract

Regular physical activity is crucial for maintaining health at every stage of life. This study aimed to assess the impact of a 14-day pause from regular physical activity during the New Year Break (NYB) on body mass components in physically active women over 60 years old. The study sample consisted of 26 females, divided into two groups: 12 who continued their physical activity (the Continuous Activity Group, CAG) and 14 who paused during the NYB (the Break Group, BG). Body mass, body fat percentage (BF%), and body mass index (BMI) were measured using the bioimpedance method, and the fat mass index (FMI) was calculated. A two-way mixed-model ANOVA revealed significant interactions between the NYB condition and time for BMI, BF%, and FMI ($P < 0.05$). These results suggest that changes in these body composition metrics over time were influenced by the NYB condition, with women who discontinued physical activity experiencing significant increases in BMI, body fat percentage, and fat mass, as confirmed by post-hoc tests ($P < 0.05$). Conversely, women who maintained regular physical activity showed no significant changes in body composition ($P > 0.05$). These findings underscore the importance of continuous physical activity in mitigating adverse changes in body composition among older women.

Keywords: women, the elderly, body fat, body mass composition, physical activity.

1. Introduction

Physical activity plays a crucial role in promoting health and reducing the risk of chronic diseases, particularly among older adults. Regular exercise reduces the likelihood of developing conditions such as diabetes, obesity, cardiovascular disease, and stroke, which are leading causes of mortality in this population (Izquierdo et al., 2021; Chodzko-Zajko, 2009). The World Health Organization (WHO) defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure (WHO, 2020). For adults and seniors, the WHO recommends at least 150 minutes of moderate or 75 minutes of vigorous physical activity per week to gain significant health benefits (WHO, 2010).

Engaging in regular physical activity improves cardiovascular and metabolic health, supports musculoskeletal function, and reduces the risk of depression across age groups (Du et al., 2013; Jakicic et al., 2019; Bangsbo et al., 2019; Jóźków et al., 2019; Domaradzki et al., 2021; Domaradzki et al., 2023). In contrast, physical inactivity is associated with an increased risk of non-communicable diseases, including ischemic heart disease, type 2 diabetes, and some cancers (Lee et al., 2012). These risks are particularly concerning for seniors, whose vulnerability to health complications grows with age. Promoting physical activity among seniors is a key strategy for mitigating the effects of aging and fostering a more active and independent lifestyle (de Oliveira et al., 2019; Twigg & Martin, 2015). Regular exercise helps older adults maintain physical fitness and supports their functional capabilities (Maciel, 2010; Viña et al., 2016). Conversely, sedentary behavior is linked to declines in aerobic capacity, muscle strength, and motor skills, exacerbating age-related physiological changes (Penha et al., 2012).

These findings underscore the importance of reducing sedentary behavior and integrating structured physical activity into the daily lives of older adults.

Holidays, such as the New Year break (NYB), are often characterized by reduced physical activity and increased caloric intake, contributing to body mass gain and adverse changes in body composition (Boutelle et al., 1999; Pierre et al., 2022). This period, which typically spans from Thanksgiving to New Year's Day, is associated with heightened stress and disruptions to regular routines (Yanovski et al., 2000; Ma et al., 2006). The structured days hypothesis posits that structured periods, such as workdays, encourage healthier behaviors compared to unstructured periods, such as weekends and holidays, when physical activity levels are lower (Brazendale et al., 2017; Fairclough et al., 2015). Evidence supports this hypothesis, showing that holiday breaks can lead to body mass gain and unfavorable body composition changes, particularly among older adults (von Hippel & Workman, 2016; Christodoulos et al., 2006). Despite these insights, research on the effects of holiday-related physical inactivity on body composition in older women remains limited. To our knowledge, no studies have specifically assessed changes in body composition and physical activity among senior women during the NYB. This gap highlights the need to better understand how brief periods of inactivity impact this vulnerable population.

The aim of this study was to evaluate the effect of a break in regular physical activity during the NYB period on body mass and its components in physically active women over 60 years of age. Additionally, we wanted to verify whether habitual physical activity may influence the magnitude of changes in the measured body composition parameters. It was hypothesized that the break would lead to significant increases in body fat mass among women who discontinued regular physical activity compared to those who maintained it. These findings are intended to inform strategies for minimizing the negative impacts of holiday-related physical inactivity among seniors.

2. Material and Methods

2.1. Study Setting and Participants

This study was conducted using a retrospective design at the Fitness Academy gym, located in (Wroclaw, Poland). The study protocol was reviewed and approved by the Senate Research Ethics Committee of the Wroclaw University of Health and Sport Sciences, Poland (No. 16/2018; date: 31.10.2018). All participants provided written informed consent to participate in this study.

The study was conducted between December 2023 and January 2024. One week directly before the NYB and immediately after the NYB. Participants were physically active senior women aged 60 years or older, who were regular attendees of Aqua Aerobics classes at the gym. Measurements were taken in the morning (between 8:00 AM and 12:00 PM) on weekdays. The first measurement occurred before the NYB, and the second measurement took place 7 to 10 days after the break. However, some of them withdrew from participation in the classes whereas others continued. Based on this they were divided into the Continuous Activity Group (CAG) and the Break Group (BG). Additionally, the participants were also assessed in terms of their physical activity during the NYB, using the Godin Leisure-Time Exercise Questionnaire (GLTEQ) (Godin, 2011). The data were used to assess the possible association between other physical activities during the NYB and body composition features.

Before recruitment, a power analysis was conducted using G*Power software (Heinrich-Heine University, Düsseldorf, Germany) to determine the required sample size. A mixed-model design (within- and between-subject effects) was used, assuming a medium effect size (ηp^2 = 0.35–0.40), α = 0.05, and 85% power. This effect size assumption was based on prior studies investigating short-term interventions on body composition (Rhea et al., 2004). The analysis indicated that a minimum of 24–30 participants would be needed.

2.2. Outcome Measures

2.2.1. Body Height and Composition

Body height was measured twice with a precision of 0.1 cm using an anthropometer (GPM Anthropological Instruments) in accordance with the protocol outlined by the International Society for the Advancement of Kinanthropometry (Marfell-Jones et al., 2006).

Bioelectrical impedance analysis (BIA) is a cost-effective and non-invasive technique for evaluating body composition (Pietrobelli et al., 2004), commonly used in field-based screening tests (Yamada et al., 2013). A TANITA MC 180 MA body monitor (Tanita Corporation, 2005) operating at a 50-kHz current frequency was employed to measure body fat (BF), muscle mass (MM), and fat-free mass (FFM) across the entire body. Segmental bioelectrical impedance analysis (SBIA) was utilized to estimate the distribution of BF and MM. Standardized conditions for bio-impedance measurements were followed as per established guidelines (Kyle et al., 2004). The participants were instructed to avoid physical activity, food, and beverages for at least three hours prior to the assessment and to empty their bladder immediately before the measurements. While the Tanita analyzer provides additional parameters such as muscle mass and visceral fat, this study focused exclusively on body fat percentage and body mass. This decision was made to align with the study's primary aim of evaluating fat tissue changes and to avoid overcomplicating the analysis. Using the recorded height and body mass measurements, Body Mass Index (BMI) in kg/m² was determined using the formula: body mass [kg]/body height [m^2], and Fat Mass Index (FMI) was calculated using the formula: body fat mass [kg]/body height [m^2].

2.2.2. Physical Activity Level

Physical activity levels were assessed using the Godin Leisure-Time Exercise Questionnaire (GLTEQ). Participants were asked to recall their engagement in various physical activities lasting at least 15 minutes in the week preceding the survey. Activities were categorized as vigorous, moderate, or mild, and assigned points (9, 5, and 3, respectively). A total score was calculated, with scores ≥24 classified as active, 14–23 as moderately active, and <14 as insufficiently active (Godin, 2011). The GLTEQ has demonstrated good reliability and validity for assessing physical activity levels in older populations (Sikes et al., 2019).

2.3. Data Analysis

Statistics were calculated in Statistica PL v. 13.0 (Tibco Software, StatSoft Poland, 2023) and jamovi v2.3.21.0 (Sydney, Australia). Prior to analysis, the normality of the data was assessed using the Shapiro-Wilk test. Homogeneity of variances was tested with Levene's test, and Mauchly's test assessed sphericity, with Greenhouse-Geisser corrections applied as needed. Descriptive statistics were expressed as means, standard deviations, and 95% confidence intervals. Independent student *t* test was performed to assess baseline results. A two-way mixed-model ANOVA was performed to examine group (fixed effect: BG vs. CAG) × time (random effect: pre-test vs. post-test) interactions. Effect sizes were reported as partial eta squared (ηp^2). Post-hoc Tukey's tests were conducted for pairwise comparisons. Pearson correlation was performed to assess the association between analyzed outcomes changes, calculated as pre-post differences with baseline physical activity level (GLTEQ – score). *P* value was set as $\alpha = 0.05$.

3. Results

Table 1 shows the descriptive statistics and *P*-values related to baseline measurements derived from an unpaired *t* test for comparison between the CAG and BG. No variable was statistically significant; however, body mass and BMI were close to significance ($P = 0.06$), as was the FMI ($P = 0.09$).

Table 2 and Figure 1 present the descriptive statistics for the analyzed body composition parameters, including pre- and post-intervention values, as well as the changes (Δ) derived from the differences between post- and pre-intervention measurements.

Table 1

Participants baseline characteristics

Variable	Total (*n* = 26)	CAG (*n* = 12)	BG (*n* = 14)	*P* value
Age, years	67.8 ± 4.9	68.4 ± 4.6	67.2 ± 5.2	0.57
Body height, cm	160.0 ± 5.2	159.9 ± 4.8	160.1 ± 5.7	0.91
Body mass, kg	72.5 ± 13.3	67.1 ± 13.1	77.2 ± 12.0	0.06
BMI, kg/m2	28.4 ± 5.3	26.2 ± 5.0	30.2 ± 5.1	0.06
Normal, *n* (%)	11 (42.3)	7 (58.3)	4 (2**8.6**)	-
Overweight, *n* (%)	4 (15.4)	2 (16.7)	2 (**14.3)**	-
Obesity, *n* (%)	11 (42.3)	3 (25.0)	8 (**57.1**)	-
Body fat, %	34.8 ± 5.5	33.3 ± 4.8	36.1 ± 5.9	0.13
FMI, kg/m2	10.1 ± 3.2	9.0 ± 2.8	11.1 ± 3.2	0.09
GLTEQ score	37.2 ± 15.9	32.0 ± 9.1	41.6 ± 19.2	0.57

CAG: Continuous Activity Group; BG: Break Group; BMI: Body mass index; GLTEQ: Godin Leisure-Time Exercise Questionnaire; FMI: Fat Mass Index. Values are expressed as mean ± SD; *P* values as a result of unpaired *t* test.

Table 2

Body composition variables at pre- and post-test between the groups

Variable	Time	CAG (*n* = 12)	BG (*n* = 14)
Body mass [kg]	Pre	67.1 ± 13.1	77.2 ± 12.0
	Post	66.8 ± 13.0	78.1 ± 11.4
	Δ	-0.3 ± 1.2 (-1.1 - 0.5)	0.9 ± 1.2 (0.2 - 1.5)
BMI [kg/m²]	Pre	26.2 ± 5.0	30.2 ± 5.1
	Post	26.1 ± 5.1	30.5 ± 4.8
	Δ	-0.1 ± 0.4 (-0.4 - 0.2)	0.3 ± 0.5 (0.1 - 0.6)
Body fat percentage [%]	Pre	33.3 ± 4.8	36.1 ± 5.9
	Post	33.2 ± 4.6	36.9 ± 6.0
	Δ	-0.1 ± 1.3 (-0.9 - 0.7)	0.8 ± 1.0 (0.2 - 1.4)
FMI [fat kg/m²]	Pre	9.0 ± 2.8	11.1 ± 3.2
	Post	8.8 ± 2.8	11.5 ± 3.3
	Δ	-0.1 ± 0.4 (-0.4 - 0.1)	0.4 ± 0.3 (0.2 - 0.6)

CAG: Continuous Activity Group**;** BG: Break Group; BMI: Body Mass Index; FMI: Fat Mass Index; Values are expressed as mean ± SD (CI); BMI: Body mass index; Δ: pre- post differences.

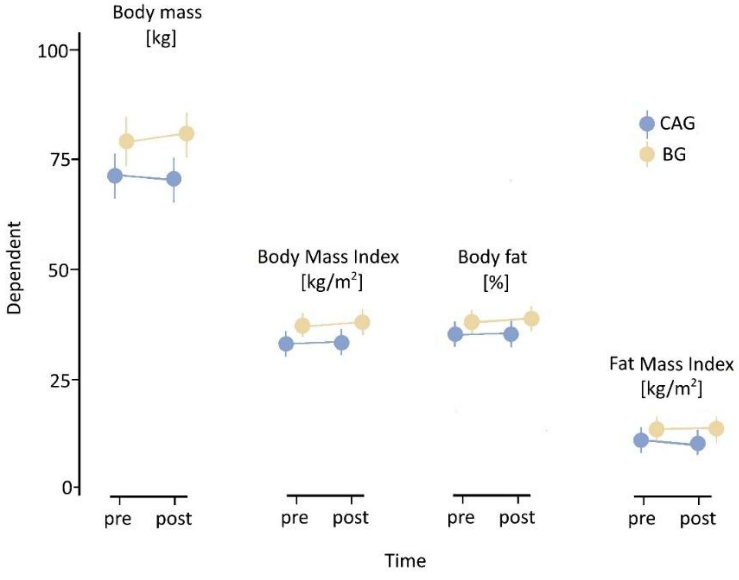

Figure 1
Body composition changes (pre- to post-New Year break) in women who either broke (BG) or continued (CAG) their regular physical activity (NYB)

No sphericity breach was noted for any variable (ε: 0.414–0.579) for the two-way (NYB-time) mixed model ANOVA and no differences in variances between the groups for any variable were observed (*P* values: 0.18–0.74) (Table 3). The analysis revealed several significant effects for the dependent variables. For body mass, a significant main effect of the NYB was observed (F = 4.83, P = 0.03, ηp^2 = 0.16), indicating moderate differences between the conditions. Additionally, the interaction between the NYB and Time was significant (F = 6.05, P = 0.02, ηp^2 = 0.20), suggesting that changes in body mass from pre- to post-assessment were dependent on the NYB condition, with a moderate to large effect size.

For BMI, the main effect of the NYB was significant (F = 4.49, P = 0.04, ηp^2 = 0.15), reflecting moderate differences between NYB conditions. Furthermore, the interaction between the NYB and Time was significant (F = 6.14, P = 0.02, ηp^2 = 0.20), indicating that changes in BMI over time were influenced by the NYB condition, with a moderate to large effect size. For body fat percentage, the interaction between the NYB and Time was significant (F = 4.38, P = 0.04, ηp^2 = 0.15), showing that changes in body fat percentage over time depended on the NYB condition, with a moderate effect size. For fat mass index, a significant main effect of the NYB was observed (F = 3.96, P = 0.05, ηp^2 = 0.14), indicating moderate differences between conditions. The interaction between the NYB and Time was also significant (F = 15.17, P = 0.01, ηp^2 = 0.39), showing a strong condition-dependent change in fat mass index over time, with a large effect size.

Table 3
Effects of the new year break and time on body composition variables (*ANOVA results*)

Variable	Effect	Mean Square	*F*	*P* value	ηp^2
Body mass, kg	NYB	1470.01	4.83	0.03	0.16
	Time	0.97	1.38	0.25	0.05
	NYB × Time Interaction	4.27	6.05	0.02	0.20
BMI, kg/m	NYB	223.91	4.49	0.04	0.15
	Time	0.15	1.56	0.22	0.06
	NYB × Time Interaction	0.62	6.14	0.02	0.20
Body Fat Percentage, %	NYB	138.0	2.238	0.13	0.09
	Time	1.47	2.25	0.15	0.09
	NYB × Time Interaction	2.86	4.38	0.04	0.15
FMI, kg/m²	NYB	73.7	3.96	0.05	0.14
	Time	0.02	2.85	0.104	0.10
	NYB × Time Interaction	0.90	15.17	0.01	0.39

BMI: Body Mass Index; NYB: New Year Break; FMI: Fat Mass Index.

Therefore, Tukey's post-hoc tests were used to reveal detailed differences. Results are presented in table 1 as *P* values for random effect. As it is seen, in the group of women who broke physical activity, i.e. the BG, all changes were significant (*P* value varied from < 0.001 for BMI and BFP, through 0.019 for body mass to 0.026 for FMI). The mean values of the outcome variables (post-test) are higher than baseline (pre-test), which suggested the gain in body mass related to gain in fat mass. The negative effect is finally confirmed in body fat percentage and fat mass index. On the other hand, the women who were continuing regular physical activity (CAG) did not change their body mass and fat mass component (all *P* values > 0.05).

4. Discussion

This study aimed to evaluate the effects of a two-week break from regular physical activity over the NYB period on body composition in physically active women over 60 years of age. Our results indicated that this brief period of inactivity was associated with a significant increase in fat tissue, which may be partially attributed to physical inactivity and possibly higher calorie intake during the festive season.

This finding aligns with previous studies highlighting the potential for body mass gain during holiday periods (Diaz-Zavala et al., 2017; Bhutani et al., 2020).

The observed increase in fat tissue during this short period underscores the vulnerability of older adults to even brief interruptions in their physical activity routines. While physical activity has been shown to be protective against fat accumulation (Roberts et al., 2017), inactivity coupled with excessive caloric intake during holidays appears to have a compounding effect. This is particularly concerning given the increased risk of cardiovascular diseases, metabolic disorders, and mortality associated with higher fat tissue levels (Williams et al., 2015; Wing et al., 2015). Older adults, already predisposed to lower levels of physical activity and reduced metabolic efficiency (Cunningham et al., 2020), may experience exacerbated health risks due to these short-term fluctuations in activity and diet.

Our findings also reinforce the critical role of sustained physical activity in mitigating these risks. The participants who maintained regular exercise during the study period did not experience changes in body composition, supporting evidence that regular physical activity serves as a protective factor against obesity and its associated health risks (Langhammer et al., 2018).

The results of our study align with research by Turicchi et al. (2020), which highlights increased caloric intake during holiday periods as a significant contributor to fat tissue gain. Similar findings were reported by Makris et al. (2010), who noted that this behavior often leads to cumulative mass gain over subsequent years. Moreover, studies such as Mason et al. (2018) have shown that targeted behavioral interventions during holiday periods can effectively prevent body fat increases, emphasizing the importance of education and structured activity programs. Beyond physiological effects, psychological factors, such as stress and festive indulgence, may also contribute to increased caloric intake during holiday periods (Erren et al., 2022). These factors underscore the multifaceted nature of body composition changes and highlight the need for comprehensive approaches to mitigating these risks.

4.1. Study Limitations, Implications and Future Directions

This study has several limitations. First, the retrospective design does not allow for causal inferences. Second, the sample size was relatively small, which limits the generalizability of the findings. Third, physical activity was self-reported, which may introduce reporting bias and inaccuracies. Fourth, dietary intake was not directly measured, as well level of stress, sleep habit, making it difficult to confirm the exact role of nutritional factors in the observed fat tissue changes. Fifth, the study focused exclusively on women, limiting its applicability to other populations. Finally, the lack of long-term follow-up precludes understanding the persistence of these changes over time.

Given the health risks associated with fat tissue accumulation, this study underscores the importance of encouraging older adults to maintain consistent physical activity, even during brief periods of potential inactivity, such as holidays. Regular exercise not only helps to regulate body composition but also enhances physical function and independence in older populations (Sardinha et al., 2018). Furthermore, public health initiatives should focus on educating individuals about the risks of holiday-related inactivity and overeating, and promote behavioral strategies such as pre-holiday exercise routines or dietary mindfulness, to minimize fat tissue gain.

Future studies should aim to include larger, more diverse populations, incorporate objective measures of physical activity and dietary intake, and explore the long-term effects of holiday-related inactivity on body composition. Additionally, research focusing on the impact of holiday breaks in other demographics, including men and younger populations, would provide a broader understanding of these effects.

5. Conclusions

This study demonstrated that a two-week period of physical inactivity over the NYB was associated with an increase in body fat tissue among older females. While our findings suggest that inactivity during the holiday break may coincide with unfavorable dietary behaviors, we did not directly evaluate dietary habits, and this remains a limitation. Aging increases the risk of various health issues, and excess fat tissue may contribute to these risks. However, our results indicate that maintaining physical activity, even during short periods of potential inactivity, may help mitigate fat tissue accumulation. Future studies are needed to explore the interaction between dietary behaviors and physical inactivity during holidays. In light of these findings, promoting consistent physical activity, particularly among older adults, remains an important public health recommendation.

STATEMENT OF ETHICS

This study was conducted in accordance with the World Medical Association Declaration of Helsinki. The study protocol was reviewed and approved by the Senate Research Ethics Committee of the Wroclaw University of Health and Sport Sciences, Poland (No. 16/2018; date: 31.10.2018). All participants provided written informed consent to participate in this study. They were thoroughly informed about the purpose, type, and methods of the research and were assured that they could withdraw at any time without providing a reason.

DECLARATION OF CONFLICTING INTERESTS

The authors declared no potential conflicts of interests with respect to the research, authorship, and/or publication of the article: *Impact of a New Year Break in Physical Activity on Body Composition in Physically Active Older Women: A Retrospective Observational Pilot Study.*

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AUTHORS' CONTRIBUTIONS

Paweł Szkudlarek: Conceptualization, Investigation, Original Draft, Review & Editing.
Dawid Koźlenia: Data Curation, Methodology, Review & Editing. Both authors approved the final version of the manuscript.

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