Influence of social media marketing on nutrition and physical activity behaviors of Romanian Generation Z students

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Abstract. Physical activity- and eating-related habits of students are usually formed during the years when they are studying in college. These behaviors often continue into their adulthood. A cross-sectional study was conducted on 1,284 students (18–25 y) including male and female students belonging to all the ages comprising the age group studied. Anthropometric measurements, i.e., height and weight were performed to calculate the body mass index (BMI). Social media (SM) usage, physical activity (PA), and nutrition behavior (NB) of the study's subjects were assessed based on the student's responses on a self-administered questionnaire. This questionnaire contained two sections: a section about the participants' demographics and time spent on SM and another section that collected the participants' views concerning the impact of SM advertisements (ads) on PA and NB. NB was assessed with the help of the Healthy Eating Index-2015 (HEI-2015) and PA was expressed in the metabolic equivalent (MET) of min/week. The subjects were divided into 3 categories in consideration of three possible responses to SM ads regarding nutrition and physical activity. These categories were: ignored, clicked, and changed behavior. Two weeks after the initiation of the main study, a subgroup of 137 subjects including both male and female students was constituted to participate in an ancillary study. The students belonging to this sub-group were aged between 19–25 years and were randomly selected. Gender variations in SM usage were reported as the female students were found to be spending more time on SM platforms. Students who had a greater interest in diet ads on the SM platforms had higher HEI-2015 averaging 4.5 points (male) and 3.1 points (females) and lower BMI averaging 3.7 units (male) and 3.9 units (female) than those who ignored these ads. Increased PA of these students by 3,427.16 MET (male) and 3,307.53 MET (female) helped in reducing their BMI by 2.9 units (male) and by 2.8 units (female). This was observed among the students with high interest in fitness programs promoted on SM platforms as against those who ignored these programs. Thus, this study demonstrated that advertising on SM platforms is a viable approach and has the potential to change attitudes and behavior regarding nutrition and physical activity among the Romanian Generation Z students.

Key words: social media, marketing, physical activity, nutritional behavior, HEI 2015 index, BMI.

Introduction

Poor diet and physical inactivity are key drivers of the obesity pandemic, and they are among the leading causes of chronic diseases such as cardiovascular dis-eases, type 2 diabetes, some cancers, and hypertension in most countries of the world. Physical activity- and eating-related habits of students are usually formed during the years when they are studying in college. Certain key points to be noted in this regard are the

following: (1). It is during their college-going years that young people gradually adopt their own dietary habits, health attitudes and behaviors. (2) These behaviors often continue into adulthood. (3). University students tend to have negative dietary habits such as skipping meals, consuming fast food, not paying attention to sufficient and balanced nutrition. (4) In addition to physical activity and sedentary behavior, eating behavior is an important factor that influences students' weight and health. (5) Overweight students are more likely to become overweight adults and run a greater risk of developing obesity. (6) To change unhealthy diet patterns and physical inactivity, innovative approaches must be used (7). Some of the tools that can be employed to change eating behaviors and encourage physical activity among students are education, legislation, and social marketing. (8) As "digital natives," today's students are known as members of Generation Z who have used digital technology ever since they were rather young and are, now, not only comfortable with using the Internet but also use SM extensively. (9) SM usage amongst students has rapidly increased over the last 10 years, and it has variable effects on students' habits. (10). SM usage is considered to be one of the most common activities of university students which impacts their daily lives. Smartphones, instant messaging, and computer games are now integral parts of their lives. (11) Social networking has become so popular that according to Anderson Analytics, 71% of social network users cannot live without it (12). Facebook and Instagram are among the most popular SM platforms for teens and young adults. Their active user base is 2.6 billion, and 1.73 billion users visit these social networking sites daily (13) Given the popularity of SM platforms among young persons, social marketing ads on these platforms become an effective way to influence their behavior. (14) SM marketing is a technique that is used to execute and evaluate programmers meant to influence the behavior of target audiences to improve their personal well-being. (15) An important objective of SM marketing specialists is to change the behavior of the target audience and not just to educate or inform. (16) This study aimed at investigating the influence of SM marketing on behaviors related to physical activity and nutrition of students.

Materials and Methods

This study consisted of a sample size of 1,284 students (18–25 y) including both male and female students. Anthropometric measurements and a self-administered anonymous questionnaire were selected as the tool for collecting data directly from the university students who were using SM. Due to the limitations of budget and time, only two universities in Romania were covered for this study. The questionnaire concerned had 3 sections covering aspects such as exposure to SM, attitudes towards SM ads, physical activity and eating habits. Two weeks after the initiation of the main study, a randomly selected subgroup of 137 subjects also including both male and female students aged between 19–25 years was constituted to participate in an ancillary study which involved a 7-day dietary tracking component that was evaluated by a dietician before these subjects were administered a questionnaire.

SM use

In consideration of the time spent by these students on SM platforms, they were divided into 3 categories: students who spent less than 3 hours a day, students who spent between 3 and 6 hours a day and students who spent more than 6 hours a day.

Response to diet advertising

There was another three-part categorization in consideration of the interest shown by the students in the ads on SM platforms. These categories were: those who are totally disinterested in these ads and ignore them, those with moderate interest in them who click on these ads then when they appear again and those having much interest in these advertisements that, after clicking on the relevant links, follow the advice that these ads offer concerning a healthy diet or desirable physical activity.

Physical activity

The subject's PA was determined based on the IPAQ questionnaire (short version) translated to Ro-

manian. Physical activity was expressed in terms of MET min/week. According to the number of METs resulting from the sum of the activities declared in the questionnaire, the participants in this study were divided into 3 categories: students with physical activity < 600 MET min/week (low sport activity level), students with physical activity between 600 and 2,999 MET min/week (moderate physical activity level) and students with physical activity > 2,999 MET min/week (high physical activity level) (17).

Food behavior

The evaluation of the students' eating habits was made using the HEI-2015 proposed by the US Department of Agriculture (18). The HEI-2015 score evaluates 13 food groups from different diet components resulting in a score ranging from 1 to 100. The closer the calculated score is to 100, the more nutritionally appropriate the diet is. To calculate HEI-2015, the subjects filled-in the DHQIII self-reporting questionnaires (19).

Anthropometric Measurements: To calculate BMI, the height and weight of the subjects were measured (20). A stadiometer device, Seca 217 (Seca, Germany), was used to measure body height. The measurement was made with a precision of ± 0.1 cm and the subjects were bare feet when their heights were measured. The weights of the subjects were measured with an accuracy of ± 0.1 kg and this was done using the Wunder (Wunder, Italy) electronic medical scale (Wunder, Italy).

Statistical analysis

Data analyses were performed using SPSS 23 (SPSS Inc., USA). The level of significance α = 0.05

was used to check the hypothesis. The difference in results was considered statistically significant when the p-value obtained was less than or equal to 0.05. It was tested whether the data have a normal distribution by using the Kolmogorov-Smirnov test. For the correlation analysis between the indices HEI-2015 and BMI and between MET and BMI, the Pearson correlation coefficient and its associated probability were calculated. The t-test for two independent samples was used to test the difference between the means of the same variable (HEI-2015, BMI or MET) measured on two categories of subjects (ignored and changed behavior). The equality of variances was tested by employing the Levene test.

Results and Discussions

SM exposure

In the category of students who spent less than 3 hours a day on SM platforms, the male students (23.13%) were 7.01 % more than the female students (16.12%) (Table 1).In the category of students who spent between 3 and 6 hours on SM platforms, find female students accounted for 51.79% which was 3.91% more than male students who accounted for 47.88%. These findings are similar to the gender variation-related findings vis-à-vis SM usage that have been reported by Alnjadat et al. (2019) (21). Among the students who spent more than 6 hours a day on SM platforms, 32.09% were females which was 3.1% more than the male students (28.99%). Similar results about time spent on SM by students were obtained by Alahmar (2016) (22) and Hawkins et al. (2020) (23).

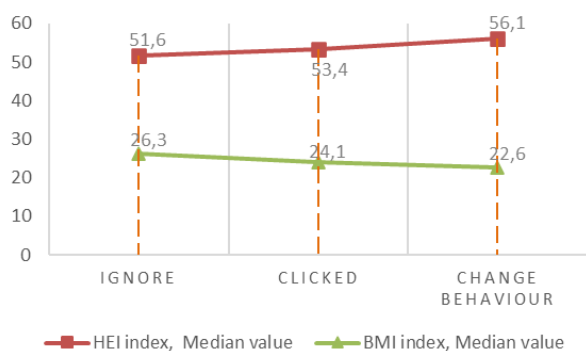Response to diet advertising and its relation to HEI-2015 and BMI

Table 1. Demographic characteristics and SM exposure of students participating in the main study and ancillary study.

Study		Main study			Ancillary study		
Age, Median value (SD)		21.6 (1.4)			21.4 (1.3)		
Gender		Male	Female	Total	Male	Female	Total
Number (%)		614 (47.82%)	670 (52.18%)	1284 (100%)	66 (48.18%)	71 (51.82%)	137 (100%)
SM exposure	< 3h/day	142 (23.13%)	108 (16.12%)	220 (17.13%)	11 (16.67%)	10 (14.08%)	21 (15.33%)
	3–6 h/day	294 (47.88%)	347 (51.79%)	641 (49.92%)	35 (53.03%)	39 (54.93%)	74 (54.01%)
	> 6h/day	178 (28.99%)	215 (32.09%)	423 (32.95%)	20 (30.30%)	22 (30.94%)	42 (30.66%)

The male student participants in the main study who showed greater interest in diet ads on SM platforms and follow diet programme guidelines had, on an average, higher HEI-2015 of 4.5 points and lower BMI of 3.7 units when compared to those who ignored these ads (Figure 1). These HEI-2015 and BMI values are close to those reported by Savu et al. (2019) (24). The HEI-2015 of male students who showed moderate interest in nutrition ads was 1.8 points higher and their BMI was 2.2 units lower, on an average, when compared with those who ignored these ads. Similar results were obtained by Laska et al. (2004) (25) and McGloin & Eslami (2015) (26).

For the main study, the Levene test refuted the equality of the variances of the two groups p = 0.013 < 0.05 (HEI-2015) p = 0.009 < 0.05 (BMI). As p = 0.021 < α = 0.05 (HEI-2015) and p = 0.017 < α = 0.05 (BMI), taking into account that the confidence interval (CI) limits (95% CI for the mean difference [-6.1213, -1.6487] for HEI-2015 and [1.7972, 5.8503] for BMI) and these values did not contain the value zero, these results suggested that there were significant differences between the BMI and HEI-2015 averages between those groups who reacted to advertisements and those who ignored them.

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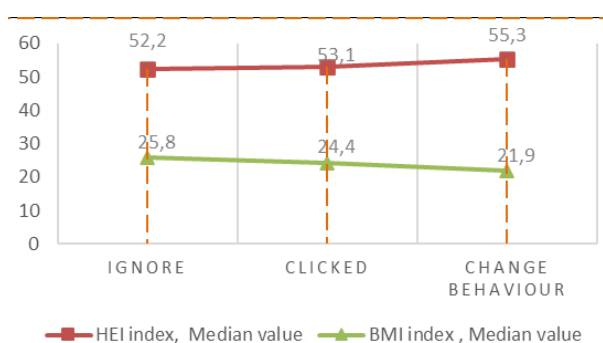
did not contain the value zero, these results suggested that there were significant differences between the BMI and HEI-2015 averages between those groups who reacted to advertisements and those who ignore them.

In the case of studies in female students, there was an increase in HEI-2015 by 3.1 points and a decrease in BMI by 3.9 units among students with a high interest in dieting versus those who ignored advertisements for nutrition programs distributed on SM platforms. (Figure 2). The female students who clicked on ads only for diets and nutrition had their average HEI-2015 0.9 points higher and BMI 1.4 units lower than those who were not interested in these ads. These values for HEI-2015 and BMI are close to those reported by Gheorghiu et al. (2019) (27).

The Levene test show inequality of the variances between the group of those who reacted to ads and those who ignored them p = 0.023 < 0.05 (HEI-2015) p = 0.013 < 0.05 (BMI). As p = 0.018 < α = 0.05 (HEI-2015) and p = 0.013 < α = 0.05 (BMI) and taking into account that the limits of the CI (95% CI for the mean difference: [-5.0215, -1.2487] for HEI-2015 and [1.8971, 5.4512] for BMI) do not contain the value zero, these results suggested that there were significant differences between the BMI and HEI-2015 averages between these two groups. Similar results were obtained by Norman et al. (2007) (28) and Parks et al. (2018) (29).

The MET of male students who reacted to fitness ads by clicking on them was 908.3 units higher than those who ignored those ads, while the BMI

Figure 1. Correlation between response to dietary advertising and HEI-2015 and BMI among male students participating in the main study.

Figure 2. Correlation between the response to dietary advertising with HEI-2015 and BMI indices for female students participating in the main study.

was 1.4 units lower. The male students who followed the fitness programs specified in the ads registered an intense physical activity with 2,519.13 MET more than those who just clicked on these advertisements and their BMI was with 2.6 units lower. The values of HEI-2015 and PA for this category are close to those reported by Trandafir et al. (2020) (30).

The variances among the groups of those who followed ads about PA and those who ignored them were not equal in the findings of the main study (Levene test: p = 0.007 < 0.005 (MET) p = 0.004 < 0.05 (BMI)). As p = 0.007 < α = 0.05 (MET) and p = 0.007 < α = 0.05 (BMI) and considering that the CI limits (95% CI for the mean difference [-2346.7213, -1253.3426] for MET and [1.8533, 3.6467] for BMI) do not contain the value zero, these results suggested that there were significant differences between the BMI and MET averages between those groups who reacted to the ads and those who ignored them.

Looking at the results, it was clear that PA of male students increased with the interest in SM ads related to fitness programs. The same trend was observed by Norman et al. (2007) (28) and Dunne et al. (2019) (31).

In the case of the female students participating in the main study, there was an increase of PA from 1483.15 MET to 2,111.32 MET which correlated with their greater interest in SM advertising as against those who were disinterested. Those with moderate interest had an increase in PA to 4,455.68 MET. For those with high interest in fitness programs described in SM ads, (Figure 4). BMI decreased in the female students who

were interested in the fitness programs on SM platforms from 25.6 averaging for those who ignored these programs to 23.1 for those who showed maximum interest (Figure 4). These values for HEI-2015, and PA are close to those reported by Huang et al. (2020) (32).

In the case of female students, the inequality of variances was confirmed (p < 0.05 for the Levene test for both the main study and the ancillary study).

For the main study, there were significant differences among the two groups of female students (test t: p = 0.017 < α = 0.05 (MET) and p = 0.012 < α = 0.05 (BMI) and the limits of CI (95% CI for the mean difference [-2352.7532, -1263.7554] for MET and [1.966, 3.6024] for BMI) did not contain the value zero.). Similar trends were observed by Cavallo et al. (2012) (33) and Lachausse (2012) (34).

Male students involved in the ancillary study who follow the dietary advertisements have a HEI-2015 9.18% higher and a BMI index 16.79% lower than those who ignore them.

For the ancillary study p = 0.011 <0.05 (HEI-2015) p = 0.014 <0.05 (BMI) shows, according to the Levene test, the inequality of variances. Because p = 0.048 <α = 0.05 (HEI-2015) and p = 0.014 <α = 0.05 (BMI) and because the CI limits (95% CI for the mean difference [-7.968, -1.2032] for HEI-2015 and [2.2241, 6.8359] for BMI) did not contain the zero value, the results suggested that, according to the t test, there were significant differences between the HEI-2015 and BMI averages of the two groups.

Female students evaluated in the ancillary study who react to advertisements have a HEI-2015 5.93%
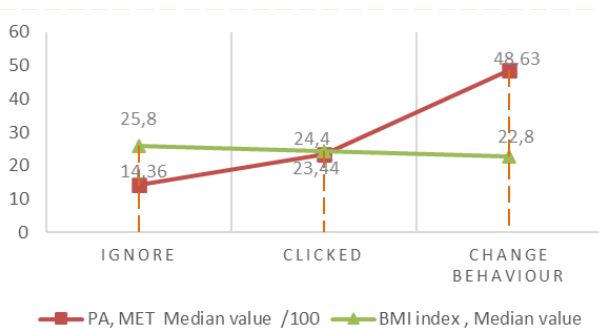
Figure 3. Correlation between the response to fitness advertising and MET and BMI for male students participating in the main study.
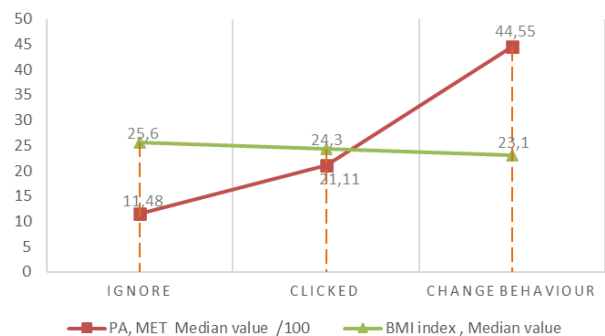
Figure 4. Correlation between the response to fitness advertising and MET and BMI for female students participating in the main study

Table 3. Correlation between the responses to dietary advertising and HEI-2015 and BMI values for students participating in the ancillary study.

Total students	137					
Age, Median value (SD)	21.4(1.6)					
Gender, number (%)		Male, 66(48.18)			Female, 71(51.82)	
Response to diet advertising, nr (%)	Ignore 24 (36.36)	Clicked 42 (63.64)	Change behaviour 25(37.88)	Ignore 25 (35.21)	Clicked 46 (64.71)	Change behaviour 28(39.44)
HEI-2015 index, Median value (SD)	51.2(2.8)	53.8(2.6)	55.9(3.6)	51.9(2.4)	53.4(2.7)	55.8(3.1)
BMI index, Median value (SD)	26.8(2.8)	24.5(2.3)	22.3(2.1)	26.1(2.4)	24.2(2.3)	21.5(2.6)

higher and BMI 15.12% lower than those who ignore them.

For the ancillary study, the Levene test showed that the variances are not equal (p = 0.013 < 0.05 (HEI-2015) p = 0.011 < 0.05 (BMI)). Because p = 0.035 < α = 0.05 (HEI-2015) and p = 0.021 < α = 0.05 (BMI) and because the CI limits (95% CI for the mean difference [-5.0021, -1.1256] for HEI-2015 and [1.6992, 5.4952] for BMI) do not contain zero value, the results suggested that, according to the t test, that there were significant differences between the HEI-2015 and BMI averages of the two groups of girls.

The boys in the ancillary study subgroup, who reacted to fitness ads had MET that was 239.22% higher and BMI that was 12.17% lower than those who ignored the ads. Variances between the two groups were not equal (Levene test: p = 0.07 < 0.015 (MET) p = 0.013 < 0.05 (BMI)). As p = 0.002 < α = 0.05 (MET) and p = 0.009 < α = 0.05 (BMI) and as the CI limits (95% CI for the mean difference were [-2464.5313, -1279.8416] for HEI-2015 and [1.809, 3.7422] for BMI) do not contain the value zero, the results suggested that there were significant differences between

the MET and BMI averages of the two groups. The average MET value of the female students tested in the ancillary study who reacted to fitness ads was 248.23% higher than those who ignored the ads, while BMI was lower by 10.57%. There were significant differences for the two groups of female students (t test: p = 0.011 < α = 0.05 (MET) and p = 0.019 < α = 0.05 (BMI) and CI limits (95% CI for the mean difference [- 2512.2332, -1298.9873] for HEI-2015 and (1.875, 3.4914) for BMI) did not contain the value zero). These results obtained in the ancillary study confirmed those from the main study.

Conclusion

Gender variations in SM usage were reported as the female students were found to spend more time on SM platforms. Students who had a greater interest in diet ads on SM platforms had a higher HEI-2015 of 4.5 points (males) and 3.1 points (females) and lower BMI of 3.7 units (males) and 3.9 units (females) when compared to those who ignored these advertisements.

Table 4. Correlation between the response to fitness advertising with MET and BMI for male students participating in the ancillary study.

Total students	137					
Age, Median value (SD)	21.4 (1.6)					
Gender, number (%)		Males 66 (48.18%)			Females 71 (51.82%)	
Response to fitness advertising, nr (%)	Ignored 27 (40.90%)	Clicked 39 (59.10%)	Changed behaviour 28 (42.42%)	Ignored 30 (42.25%)	Clicked 41 (57.75%)	Changed beahaviour 29 (40.85%)
PA, MET Median value (SD)	1372.14 (16.21%)	2216.85 (20.61%)	4654.49 (28.34%)	1252.86 (16.32%)	2264.5 %	4362.83 (31.24%)
BMI, Median value (SD)	26.3 (2.8%)	25.1 (2.7%)	23.4 (2.9%)	26.5 (2.3%)	24.6 (2.6%)	23.7 (2.4%)

There was an increase in PA of students with 3,427.16 MET (males) and 3307.53 MET (females) and BMI decreased by 2.9 units (males) and by 2.8 units (females) for students with high interest in fitness programs promoted on SM platforms when compared to those who ignored these programs. This study demonstrates that advertising on social marketing is a viable tool and has the potential to change attitudes and behavior regarding nutrition and physical activity of Romanian Generation Z students. The study's conclusions show that the educational programs that are meant for and addressed to young people must be transmitted through those media channels that are preferred by them.

Limitations

The sample of the study was limited to Romanian students in the age group of 19–25 years.

Studies including larger samples from different age groups and countries can be even more helpful in establishing age- and sex-specific indices and correlations related to the overall subject/objective of this study.

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