



Dietary supplementation and health behavior in a sample of young adults in Austria

Marie Celine Dorczok¹ · Beate Schrank^{1,2} · Gloria Mittmann¹ · Verena Steiner-Hofbauer¹

Received: 22 December 2023 / Accepted: 15 April 2024
© The Author(s) 2024

Abstract

Aim The market for dietary supplements (DS) is booming since DS can be a simple and targeted dietary component if a wholesome nutrition is not available. DS consumption might be linked to other health behaviors that help people to maintain health and reduce potential health risks. The aim of this study was to identify and compare selected health behaviors among young Austrian DS consumers.

Subjects and methods An online questionnaire (including dietary habits, consumption of DS, physical activity, general state of health, DEGS FFQ) was handed out via a panel distribution to young Austrian adults aged 18 to 30 years.

Results The questionnaire was answered by 400 participants, of which 33% consumed DS regularly. There were no significant differences between the sexes with regard to the consumption of DS. Most participants (66%) consumed DS without medical prescription. Only the consumption of healthy food as well as weekly time spent on sports as part of health behavior was able to predict DS consumption.

Conclusion Although DS consumers show significantly higher levels of health behavior in some facets, they do not differ from non-DS consumers in a large number of health-relevant aspects. Our results indicate that DS consumers exhibit a broader spectrum of health-relevant behaviors than non-DS consumers and thus contribute to maintaining their health. Further studies with larger national samples and alternative assessment methods are necessary to consolidate the existing results and hypotheses.

Keywords Dietary supplementation · Health behavior · Young adults · Nutrition psychiatry · Transition psychiatry · Austria

Introduction

Whether in sports, during pregnancy, or with an unbalanced diet, dietary supplements (DS) can compensate for deficiencies and supply the body with essential nutrients. Depending on their needs, consumers can choose the right DS from a constantly growing range of products (Barthels and Pietrowsky 2012). According to national surveys, approximately 30% of adults in Dubai (United Arab Emirates) to up to 50% of American adults already consume DS on a

regular basis (Abdulla et al. 2019; Mishra et al. 2021). Numbers are similarly high for other developed countries worldwide (Dickinson and MacKay 2014). As the current state of research shows, nutrition and health behavior are dependent on culture and society and therefore vary to a greater or lesser extent in different regions of the world (Langness et al. 2005; Pitt et al. 2017). Current forecasts assume that the market size of DS will continue to grow in the upcoming years. The global market size of DS amounted to around 112 billion dollars in 2018 and is expected to more than double by 2028 (Lordan 2021).

The consumption of dietary supplements is not considered necessary or recommended as long as one adheres to a healthy and balanced diet. Thus, DS can be a simple and targeted dietary component if a wholesome nutrition is not available. While a vegan diet primarily requires the addition of B vitamins and calcium, zinc and iron can be beneficial for women in childbearing age (Mensink et al. 2013; Neufingerl and Eilander 2021). Mixed results exist

✉ Marie Celine Dorczok
marie.dorczok@kl.ac.at

¹ Karl Landsteiner University of Health Sciences, Research Centre Transitional Psychiatry at the Tulln University Hospital Site, Dr. Karl-Dorrek-Straße 30, 3500 Krems, Austria

² Department of Psychiatry and Psychotherapeutic Medicine, University Hospital Tulln, Tulln, Austria

about who consumes DS and why. On the one hand, it is mainly older people with poorer subjective health who use DS to improve their general health (Frey et al. 2017). Ilowiecka et al. found evidence in their international study with 3500 DS-consumers that DS might be used as a substitute for a balanced micro- and macronutrient intake in adults with less healthy eating habits (Ilowiecka et al. 2022). On the other hand, healthier food choices, a higher level of education, more physical activity, and a lower body mass index (BMI) were also identified as significant predictors of supplement intake (Dickinson and MacKay 2014; Frey et al. 2017; Marques-Vidal et al. 2009). Various studies from different countries have also shown that more women than men consume DS (Dickinson and MacKay 2014; Marques-Vidal et al. 2009). Another frequently cited motive found in different international surveys is the maintenance or improvement of general health and well-being (Dickinson and MacKay 2014; Frey et al. 2017). DS consumption might be linked to other health behaviors which serve people to maintain health and reduce potential health risks (Sniehotta et al. 2005). This includes, among other things, a higher daily intake of fruit and vegetables, regular exercise as well as less alcohol consumption (Cowan et al. 2018; Dickinson and MacKay 2014; Kofoed et al. 2015).

Nutrition and lifestyle are particularly important during the transition from adolescence to adulthood, as a number of important developmental tasks must be mastered. One of them is gaining independence and personal responsibility regarding health behavior (Zeiler et al. 2016). Therefore, this study aimed to identify and compare selected health behaviors among young DS consumers in Austria. To our knowledge, data on attitudes toward DS and health behavior is lacking on the general population in Austria with special regard to young adults.

Method/material

Recruitment and procedure

The study was conducted via a cross-sectional online questionnaire with the aim of surveying different aspects of lifestyle and nutrition. Participants were recruited via a panel distribution of the Österreichische Gallup-Institut GmbH. Inclusion criterion for involvement in the study was an age between 18 and 30 years. The questionnaire could only be started if informed consent was given by ticking a box at the beginning of the study. Participation in the survey was voluntary and anonymous. The whole survey took approximately 20 min.

Materials

The survey included general questions on dietary habits, intake of dietary supplements, physical activity and general state of health. To record food consumption, participants were given an adapted version of the Food Frequency Scale (DEGS FFQ) (Haftenberger et al. 2010), a semi-quantitative questionnaire asking about the frequency and quantities of different food groups consumed.

Analysis

For statistical analysis, SPSS 28.0.1.0 was used (IBM Corp. 2021). Participants were able to choose from a wide range of DS, which ones they consumed and for what period of time on a 6-point likert scale (“never” to “more than 12 months”). In addition, there was the option to add further DS. We compared the mean values of all variables between DS consumers and non-DS consumers. Chi² tests were used to assess the relationship between the intake of DS (“Yes,” “No”) and nutrition style (vegan, vegetarian, omnivorous) as well as a *t*-test to calculate the mean value comparison of DS intake (“Yes,” “No”) and mean hours of exercise per week.

To indicate health behavior-related predictors affecting DS consumption, a binary logistic regression model analysis was performed. Significance was set at $p < 0.05$. For import of the predictors, separate variables were created for healthy/unhealthy eating, unhealthy snacks, healthy/unhealthy drinking, as well as alcohol consumption based on DEGS FFQ. The items included were selected based on the current literature on health and nutrition (Herforth et al. 2019). An average value of the consumption frequency was calculated according to the category. Nutrition-related predictors were supplemented by the average number of hours of exercise per week.

Based on the World Health Organization (WHO) classification for adults, BMI was calculated using participants' body weight (kg) and height (m) (World Health Organisation 1995).

Results

Participants

The total sample consisted of 400 participants aged between 18 and 30 years ($M = 24.92$ years, $SD = 3.51$). Mean BMI in the sample was 23.28 ($SD = 4.19$). One hundred fifteen participants identified as male, 282 as female,

three as non-binary. The three non-binary participants were excluded from all gender specific analyses.

Further socio-demographic characteristics of the survey group can be found in Table 1.

Table 1 Sociodemographic characteristics of the sample ($N=400$)

	Overall $N=400$	DS consumer $n=130$	Non-DS consumer $n=270$
Gender			
Male	115 (28.7%)	37 (28.5%)	78 (28.9%)
Female	282 (70.5%)	93 (71.5%)	189 (70%)
Non-binary*	3 (.8%)	–	3 (1.1%)
BMI			
Underweight (<18.5)	26 (6.5%)	13 (10%)	13 (4.8%)
Normal weight (18.5–24.9)	255 (64.2%)	80 (61.5%)	177 (65.6%)
Overweight (25.0–29.9)	93 (23.4%)	28 (21.5%)	65 (24.1%)
Severe overweight (>30.0)	23 (5.8%)	9 (6.9%)	15 (5.6%)
Educational level			
No completed education	1 (.3%)	–	1 (.4%)
Compulsory school	22 (5.5%)	8 (6.2%)	14 (5.2%)
Apprenticeship	51 (12.8%)	14 (10.8%)	37 (13.7%)
Matura/a-levels	172 (43.3%)	62 (47.7%)	112 (41.5%)
University degree	151 (38%)	46 (35.4%)	106 (39.3%)

There were no significant differences between the groups of DS consumers and non-DS consumers

*excluded from all gender-specific analyses

Table 2 Descriptive overview of DS consumer behavior by gender

	Overall DS consumer $n=130$	Female DS consumer $n=93$	Male DS consumer $n=37$
Prescription			
With medical prescription	44 (33.8%)	36 (38.71%)	8 (21.62%)
Without medical prescription	86 (66.2%)	57 (61.29%)	29 (78.38%)
DS preparations/ingredients^a			
Vitamin D	103 (79.2%)	73 (78.49%)	30 (81.08%)
B vitamins	76 (58.5%)	54 (58.06%)	22 (59.46%)
Magnesium	73 (56.2%)	48 (51.61%)	25 (67.57%)
Iron	72 (55.4%)	58 (62.37%)	14 (37.84%)
Main reasons for consumption^a			
Immune system	96 (73.8%)	65 (69.89%)	31 (83.78%)
Skin–hair–nails	64 (49.2%)	49 (52.69%)	15 (40.54%)
Resilience	60 (46.2%)	39 (41.94%)	21 (56.76%)
Sleep/relaxation	56 (43.1%)	33 (35.48%)	23 (62.22%)

Only the answers which more than 50% of DS consumers chose are presented

There were no significant differences between male and female DS consumers

^a multiple selection possible

* $n=3$ non-binary persons excluded from all gender-specific analyses

Prevalence of dietary supplement consumption

Out of a total of 400 participants, 130 people (32.5%) stated that they were taking DS at the time of the survey; 16.5% also stated that they consumed DS occasionally—these people were not included in the group of DS consumers due to their irregular intake. There was no significant difference in the consumption of DS between women and men, $X^2(1, N=397)=0.024, p=0.877$.

Participants stated that they took an average of five different supplements at the same time ($M=5.38, SD=3.63$). More than one third (32.4%) of DS consumers stated that they had been consuming dietary supplements regularly for more than a year. 19.2% of DS consumers stated that they suffer from a chronic illness. However, there was no significant difference compared to non-DS consumers (16.3%), $X^2(1, N=400)=0.529, p=0.467$. Further details on DS consumption behavior can be found in Table 2.

DS consumption and health behavior

Of the DS consumers surveyed, 6.2% were vegan, 13.8% were vegetarian, and 76.2% referred to a mixed diet. Gluten-free, halal, pescetarian, and carbohydrate-free were diet-specific statements that were added in the open response format. The most common reason for a specialized diet was of an ethical nature (55.32%), followed by health reasons (36.17%). Based on Chi^2 calculations, DS consumers did not differ significantly from non-DS consumers in terms of their eating style, $X^2(3, N=400)=4.203, p=0.24$.

People who consumed DS regularly stated that they spent an average of four hours ($M=4.08$, $SD=3.88$) and nine minutes ($M=9.14$, $SD=13.7$) per week exercising. Strength training ($M=33.01$, $SD=31.17$) and endurance training ($M=29.14$, $SD=27.72$) accounted for the largest proportion of training. The 130 participants who consumed DS ($M=253.75$, $SD=231.63$) compared to the 270 participants who did not consume DS ($M=180.96$, $SD=204.83$) demonstrated significantly more time spent on sports per week, $t(228,873)=-3.05$, $p=0.003$.

Logistic regression was used to analyze the relationship between DS consumption and health behavior-related factors. It was found that the odds of consuming DS increased by 28% (95% CI [1.020, 1.610]) for people who showed healthy eating patterns. The odds of consuming DS increased by 0.1% (95% CI [1.000, 1.002]) for each additional hour of sport per week. Cohen's f^2 was 0.09, which corresponds to a small effect (Cohen 1992). All model coefficients and ORs can be found in Table 3.

Discussion

We investigated the prevalence of DS consumption and its relationship with selected health behaviors in a sample of young Austrians.

One third (33%) of our sample used DS regularly, which is similar to other European countries (e.g., 40% in Germany) (Frey et al. 2017; Ilowiecka et al. 2022) as well as Dubai (38%) (Abdulla et al. 2019; Ilowiecka et al. 2022). Prevalences for regular consumption of DS in general samples are considerably higher in the USA (58%) (Mishra et al. 2021). When compared to international age-equivalent samples, similar prevalences were found in Iran (33%) and Dubai (36%), among others (Radwan et al. 2019; Sotoudeh et al. 2015). In a sample of Japanese college students, the prevalence of DS use was only 17% (Kobayashi et al. 2017). Compared to our sample, the prevalences in a sample of

Chinese university students were almost twice as high (59%) (Liu et al. 2018). Overall, most studies indicate that DS consumption tends to increase with age (Kobayashi et al. 2017).

Our results do not confirm the findings of previous international studies, which assumed that DS were predominantly consumed by women (Dickinson and MacKay 2014; Radwan et al. 2019). Most studies with age-equivalent samples also show differences between the sexes regarding DS consumption (Liu et al. 2018; Radwan et al. 2019; Sotoudeh et al. 2015). In our sample, there were no significant differences between the sexes with regard to the consumption of DS. This could be a result of higher health awareness among young men or due to increased marketing tailored to a male customer base.

Even though the consumption of DS is not necessarily part of a healthy diet, DS can be a valuable supplement in the event of insufficient nutrient intake. In our study, most participants (66%) consumed DS without medical prescription. Consumers should be aware, that DS consumption might cause potential harm such as drug interactions, an increased medication burden as well as financial burden, tardiness of more effective therapy and dashed hopes (Moses 2021). Even though the occurrence of medical side effects as a reaction to the incorrect or excessive intake of DS is still the subject of scientific discourse, seeking medical advice is strongly recommended (Geller et al. 2015).

Our results indicate that individuals who pursue a healthy lifestyle are more likely to consume DS. DS consumers might be more aware of their health which is reflected in both a healthier diet and a higher number of hours of exercise per week. Our results support previous findings that DS consumers are generally more health-conscious and therefore exhibit more health-promoting behavior than non-DS consumers (Bailey et al. 2011; Foote et al. 2003), also in our population of young Austrian adults.

Health behavior includes both the regular practice of health-promoting measures, such as regular exercise and a healthy diet, and the avoidance of health-damaging

Table 3 Logistic regression analysis regarding health behaviors and their effect on DS consumption

	<i>B</i>	<i>SE</i>	Wald	<i>p</i>	Odds ratio (OR)	95% CI for OR	
						Lower bound	Upper bound
Healthy eating	.248	.116	4.553	.033*	1.282	1.020	1.610
Unhealthy eating	.533	.417	1.636	.200	1.705	.752	3.862
Snacking	-.110	.321	.118	.731	.896	.477	1.681
Healthy drinking	.006	.054	.010	.919	1.006	.905	1.118
Unhealthy drinking	-.079	.107	.540	.463	.924	.750	1.140
Alcohol	-.008	.117	.005	.945	.992	.788	1.249
Sports	.001	.001	7.229	.007**	1.001	1.000	1.002
Constant	2.866	.803	12.721				

Degrees of freedom were 1 for all Wald statistics

* $<.05$. ** $<.01$

measures, such as the consumption of alcohol (Sheeran et al. 2001). Based on various characteristics and functions, individual health behavior can also change over the course of a lifetime; Renner and Staudinger (2008) refer to a multidimensional approach of health behavior. Accordingly, the consumption of DS can be understood as a facet of health behavior. For our sample, the use of DS as individual health behavior is supplemented by healthier eating and more weekly exercise. No significant association was found for unhealthy eating or drinking, alcohol consumption, healthy drinking or unhealthy snacking for DS consumption behavior. Although DS consumers show significantly higher levels of health behavior in some facets, they do not differ from non-DS consumers in a large number of health-relevant aspects. Our results indicate that DS consumers exhibit a broader spectrum of health-relevant behaviors than non-DS consumers and thus contribute to maintaining their health. It is not only in nutritional science that it is now assumed that the widest possible range of variety, regardless of category, has the greatest benefit for long-term health (Berry et al. 2020; Zeevi et al. 2015).

Limitations

This article provides a comprehensive overview of health behavior in a sample of young Austrian DS consumers. However, it is important to acknowledge certain limitations that may hinder drawing definitive conclusions. First, all health behavior variables were only collected on the basis of self-assessment. Secondly, our sample was a highly educated sample of only young adults – drawing conclusions about the general Austrian population is therefore limited.

Conclusion

A rapid increase in the consumption of DS in recent years as well as the prospects of a further increase urged us to compare selected health behaviors of young Austrian DS consumers. Most participants were characterized by a healthy BMI, limited alcohol consumption, healthy eating patterns, and a sufficient amount of weekly exercising. However, only the consumption of healthy food as well as weekly time spent on exercise as part of health behavior was able to predict DS consumption. DS consumers therefore exhibit a broader range of health behaviors. Further studies with larger national samples and alternative assessment methods are necessary to consolidate the existing results and hypotheses.

Author contributions Marie Celine Dorczok: conceptualization, writing—original draft, data curation and analysis, writing—review & editing; Beate Schrank: writing—review & editing; Gloria Mittmann: writing—review & editing; Verena Steiner-Hofbauer: funding acquisition, review & editing.

Funding Open access funding provided by Karl Landsteiner University. We acknowledge support by Open Access Publishing Fund of Karl Landsteiner University of Health Sciences, Krems, Austria.

Data availability The authors are willing to share their data, analytics methods and study materials with other researchers upon reasonable request.

Code availability Not applicable.

Declarations

Ethics approval The study was an anonymous online questionnaire study, so no ethics approval was required. The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

Ethical statement The study was an anonymous online questionnaire study, so no ethics approval was required. The procedures used in this study adhere to the tenets of the Declaration of Helsinki. Informed consent was obtained from all individual participants included in the study.

Consent to participate Informed consent was obtained from all individual participants included in the study.

Consent for publication Not applicable.

Conflict of interest We have no conflict of interest to declare.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Abdulla NM, Aziz F, Blair I et al (2019) Prevalence of, and factors associated with health supplement use in Dubai, United Arab Emirates: a population-based cross-sectional study. *BMC Complement Altern Med* 19:172. <https://doi.org/10.1186/s12906-019-2593-6>
- Bailey RL, Gahche JJ, Lentino CV et al. (2011) Dietary supplement use in the United States, 2003–2006 *J Nutr* 141:261–266. <https://doi.org/10.3945/jn.110.133025>
- Barthels F, Pietrowsky R (2012) Orthorectic eating behaviour - nosology and prevalence rates. *Psychother Psychosom Med Psychol* 62:445–449. <https://doi.org/10.1055/s-0032-1312630>

- Berry SE, Valdes AM, Drew DA et al (2020) Human postprandial responses to food and potential for precision nutrition. *Nat Med* 26:964–973. <https://doi.org/10.1038/s41591-020-0934-0>
- Cohen J (1992) Statistical power analysis. *Curr Dir Psychol Sci* 1:98–101. <https://doi.org/10.1111/1467-8721.ep10768783>
- Cowan AE, Jun S, Gahche JJ et al. (2018) Dietary supplement use differs by socioeconomic and health-related characteristics among U.S. adults, NHANES 2011(–)2014 *Nutrients* 10. <https://doi.org/10.3390/nu10081114>
- Dickinson A, MacKay D (2014) Health habits and other characteristics of dietary supplement users: a review. *Nutr J* 13:14. <https://doi.org/10.1186/1475-2891-13-14>
- Footo JA, Murphy SP, Wilkens LR et al (2003) Factors associated with dietary supplement use among healthy adults of five ethnicities: the multiethnic cohort study. *Am J Epidemiol* 157:888–897. <https://doi.org/10.1093/aje/kwg072>
- Frey A, Hoffmann I, Heuer T (2017) Characterisation of vitamin and mineral supplement users differentiated according to their motives for using supplements: results of the German National Nutrition Monitoring (NEMONIT) *Public Health Nutr* 20:2173–2182. <https://doi.org/10.1017/S1368980017001021>
- Geller AI, Shehab N, Weidle NJ et al (2015) Emergency department visits for adverse events related to dietary supplements. *N Engl J Med* 373:1531–1540. <https://doi.org/10.1056/NEJMsa1504267>
- Haftenberger M, Heuer T, Heidemann C et al (2010) Relative validation of a food frequency questionnaire for national health and nutrition monitoring. *Nutr J* 9:36. <https://doi.org/10.1186/1475-2891-9-36>
- Herforth A, Arimond M, Alvarez-Sanchez C et al. (2019) A global review of food-based dietary guidelines 10:590-605. <https://doi.org/10.1093/advances/nmy130>
- Ilowiecka K, Maslej M, Czajka M et al (2022) Lifestyle, eating habits, and Hhealth behaviors among dietary supplement users in three European countries. *Front Public Health* 10:892233. <https://doi.org/10.3389/fpubh.2022.892233>
- Kobayashi E, Sato Y, Umegaki K et al. (2017) The prevalence of dietary supplement use among college students: a nationwide survey in Japan. *Nutrients* 9. <https://doi.org/10.3390/nu9111250>
- Kofoed CLF, Christensen J, Dragsted LO et al. (2015) Determinants of dietary supplement use--healthy individuals use dietary supplements *Br J Nutr* 113:1993–2000. <https://doi.org/10.1017/S0007114515001440>
- Langness A, Richter M, Hurrelmann K (2005) Health behaviour in school-aged children--results of the international study. *Health Behavior School-Aged Child* 67:422–431. <https://doi.org/10.1055/s-2005-858355>
- Liu H, Yang Y, Xu D et al. (2018) Investigation and comparison of nutritional supplement use, knowledge, and attitudes in medical and non-medical students in China. *Nutrients* 10. <https://doi.org/10.3390/nu10111810>
- Lordan R (2021) Dietary supplements and nutraceuticals market growth during the coronavirus pandemic - implications for consumers and regulatory oversight. *PharmaNutrition* 18:100282. <https://doi.org/10.1016/j.phanu.2021.100282>
- Marques-Vidal P, Pecoud A, Hayoz D et al. (2009) Prevalence and characteristics of vitamin or dietary supplement users in Lausanne, Switzerland: the CoLaus study. *Eur J Clin Nutr* 63:273–281. <https://doi.org/10.1038/sj.ejcn.1602932>
- Mensink GBM, Fletcher R, Gurinovic M et al (2013) Mapping low intake of micronutrients across Europe. *Br J Nutr* 110:755–773. <https://doi.org/10.1017/S000711451200565X>
- Mishra S, Stierman B, Gahche JJ, Potischman N (2021) Dietary supplement use among adults: United States, 2017–2018. *NCHS Data Brief* 399:1–8
- Moses G (2021) The safety of commonly used vitamins and minerals. *Aust Prescr* 44:119–123. <https://doi.org/10.18773/austprescr.2021.029>
- Neufingerl N, Eilander A (2021) Nutrient intake and status in adults consuming plant-based diets compared to meat-eaters: a systematic review. *Nutrients* 14. <https://doi.org/10.3390/nu14010029>
- Pitt E, Gallegos D, Comans T et al (2017) Exploring the influence of local food environments on food behaviours: a systematic review of qualitative literature. *Public Health Nutr* 20:2393–2405. <https://doi.org/10.1017/S1368980017001069>
- Radwan H, Hasan HA, Ghanem L et al (2019) Prevalence of dietary supplement use and associated factors among college students in the United Arab Emirates. *J Community Health* 44:1135–1140. <https://doi.org/10.1007/s10900-019-00700-2>
- Renner B, Staudinger UM (2008) Gesundheitsverhalten alter Menschen. In: Kuhlmei A, Schäffer D (eds.) *Alter, Gesundheit und Krankheit*, pp 193–206. Bern: Huber
- Sheeran P, Conner M, Norman P (2001) Can the theory of planned behavior explain patterns of health behavior change? *Health Psychol* 20:12–19. <https://doi.org/10.1037/0278-6133.20.1.12>
- Sniehotta FF, Scholz U, Schwarzer R et al (2005) Long-term effects of two psychological interventions on physical exercise and self-regulation following coronary rehabilitation. *Int J Behav Med* 12:244–255. https://doi.org/10.1207/s15327558ijbm1204_5
- Sotoudeh G, Kabiri S, Yeganeh HS et al (2015) Predictors of dietary supplement usage among medical interns of Tehran university of medical sciences. *J Health Popul Nutr* 33:68–75
- World Health Organization (1995) Physical status: The use of and interpretation of anthropometry, Report of a WHO Expert Committee. World Health Organization
- Zeevi D, Korem T, Zmora N et al (2015) Personalized nutrition by prediction of glycemic responses. *Cell* 163:1079–1094. <https://doi.org/10.1016/j.cell.2015.11.001>
- Zeiler M, Waldherr K, Philipp J et al (2016) Prevalence of eating disorder risk and associations with health-related quality of life: results from a large school-based population screening. *Eur Eat Disord Rev* 24:9–18. <https://doi.org/10.1002/erv.2368>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.