Introduction

Background

The Internet is a widely used and cost-effective approach to communicate health information. Indeed, online searching for health information has had a steady growth during the last decade [1]. Usually, nutrition, diet, and fitness are among the most searched health topics by Internet users [2]. Nutrition websites typically provide content related to specific diets, healthy meals, etc.; weight loss websites provide content about diets or instructions for how to lose weight; and fitness websites provide content regarding exercise and sports. The content provided by these websites includes diverse health information [3–5], and not solely health information provided by journalists as happens with traditional media [6], but also from other Internet users. In this way, these websites can provide a space for online communication, social interactions, behavioral support, help seeking, and other similar options not commonly available in traditional media like television [7–10]. Considering the influence of the Internet on health behavior, notable efforts have been made to understand health-related Internet users beyond their health-information-seeking behavior [3,4,11]. Nevertheless, it should be noted that health-related Internet users are diverse in their motivations and individual characteristics [12], and particularly when it comes to the usage of nutrition, weight loss, and fitness websites. Moreover, given that past studies have usually been limited to examining the information-seeking behavior of these Internet users, little is known about the individual characteristics associated with the usage of
nutrition, weight loss, and fitness websites. Therefore, the aim of this study is to examine the individual factors associated with the usage of nutrition, weight loss, and fitness websites.

**Past research**

The health information, online communication, and online interactions within nutrition, weight loss, and fitness websites can be related to positive outcomes, such as a healthier diet or a higher adherence to physical activity [3]. However, health-related Internet use can also be associated with negative outcomes, like the misuse of information and the adoption of risky health behaviors, such as unhealthy weight control behaviors [13,14]. In fact, health-related Internet use, or more specifically the exposure to online media messages regarding nutrition, weight loss and fitness, can positively and/or negatively shape individuals’ health-related beliefs and behaviors [15,16]. However, it should be noted that individual differences play an important role in the selection and usage frequency of nutrition, weight loss, and fitness websites, such as eating disorder symptomatology [14]; the extent of the internalization of the ideal body [17]; the levels of exercise [13]; body mass index (BMI); and sociodemographic characteristics, such as gender and age [3,18].

For instance, studies suggest that health Internet usage is more common among young adult women than men, particularly to seek health information [11,19]. More specifically, studies on Internet usage regarding diet, weight loss, and fitness have found that as many as 85% of the users are female [8,20,21]. Also, compared to men, women are more likely to be exposed to eating disorder content [22]. Considering the gender gap in body image concerns, weight concerns, and eating disorder symptomatology [23], it is hardly surprising that there is a mutual association between disordered eating and Internet usage for weight loss among women. In fact, studies with young women have found that the use of web-based weight loss information
predicts disordered eating [14], whereas self-reported eating disorder also predicts the interest in diet/fitness websites [20]. Moreover, it is not uncommon to see individuals with disordered eating symptomatology joining online communities mostly to get tips and tricks for weight loss, as well as social support [24]. Similarly, overweight and particularly obese individuals experience the stigma against obesity [25]; therefore, it is not surprising to see them turn to the Internet for weight loss solutions, thus suggesting a positive linear association between body weight and usage of nutrition, weight loss, and fitness websites [10]. Indeed, a large survey found that individuals with a higher BMI were more likely to use the Internet to get information and help regarding diet, weight, and physical activity [3].

Internalization is another important individual factor that seems to account for the Internet usage of nutrition, weight loss, and fitness websites. There is evidence that media spreads an ideal of beauty that people “internalize” and renders them more prone to inappropriately change their nutrition or physical activity habits, such as taking physical appearance enhancers or doing strenuous exercise in order to achieve the “ideal body” [26,27]. For this reason, internalization is included within a group of individual differences that account for the levels of susceptibility to the effects of media [28], as well as in theoretical models that explain the effect of media on young women’s body image concerns [17]. In this sense, it is suggested that individuals with high levels of internalization (i.e., susceptible individuals) would gravitate to appearance-focused media content, such as websites focused on weight loss for appearance reasons. In turn, by selectively exposing themselves to this type of media content, users will prompt other psychological processes, such as social comparisons for, i.e., comparing one’s body shape to others’ [17]. Thus, following Perloff’s model, rather than considering a one-way effect that media use may have on attitudes and behaviors, there would be mutual
reinforcement [17]. In other words, internalization not only accounts for the effect of media exposure [27], but also for a dispositional factor to subsequent media usage [28].

Although there is some evidence for the influence of online media on exercise and fitness [13], less is known about the association between excessive exercise and the usage of nutrition, weight loss, and fitness websites. For instance, a recent study exploring the characteristics of women who post travel images and women who post “fitspiration” images (i.e., promoting a healthy lifestyle through fitness), found higher levels of compulsive exercise and disordered eating in the fitspiration group [29]. By contrast, another study found that the usage of mobile phone applications to keep track of meals or exercise routines, but not blogs or microblogging (e.g., Instagram, Twitter) about nutrition and exercise, was associated with compulsive exercise [30].

Finally, large studies suggest that health Internet usage is highly motivated by the opportunity to get advice from other Internet users about health-related issues [11]. For instance, a study with the participants in an online community of individuals with high levels of disordered eating found that the main motive to join the online community was to get support and advice regarding weight loss [24]. Similarly, other studies suggest that some people turn to the Internet to supplement professional medical advice, particularly when they are looking for advice on specific health issues or conditions [31]. Thus, this online peer-to-peer health care reflects the importance of the online collaborative problem solving and, specifically, online social support regarding health behaviors [32].

**The present study**

Consequently, the present study is aimed at exploring which individual factors are associated with the frequency of the usage of nutrition, weight loss, and fitness websites. We are
specifically examining the links associated with sociodemographic variables (i.e., gender and age), eating disorder symptomatology, weight status, the tendency for excessive exercise, and the levels of internalization and perceived social support from website users. Upon this examination, we aim to uncover which of the above mentioned factors could predict the usage of the different types of websites.

Methods

Participants

The study utilizes data from the visitors of websites focused on nutrition, weight loss, and exercise collected as part of a project on eating behaviors in the context of Internet and technology use. It was approved by the Research Ethics Committee of the University [BLINDED]. The data were collected via online survey between May and October 2016. For participant recruitment, Czech websites oriented to nutrition, weight loss, and fitness were asked to publish an invitation for study participation. The invitation was published on 65 websites and discussion forums. All the participants were informed about the purpose of the research and were asked to provide informed consent. Participants were motivated by the chance to win one of five vouchers for an e-shop in the amount of 40 euros each. From the original sample, which comprises 1,002 respondents, we excluded participants aged 40 and older (n = 36, 3.6% of the whole sample); participants who did not provide a sufficient amount of data regarding their individual characteristics, which were measured on the last page on the questionnaire (n = 274, 27.3% of the whole sample); and participants who reported that the reason for the website visits was because of the health issues of someone else (therefore, possibly lacking the personal motivation connected to their own eating and health status). The latter reason for expulsion was indicated by the question “Do you visit the sites about nutrition or sports not for yourself, but
mainly because you want to help with the nutrition or sport of another person (partner, child, parent, etc.)?” and the answer “Definitely applies” (n = 55, 5% of the whole sample); this excluded 335 respondents in total. Moreover, we excluded respondents with occasional missing values, yielding a final sample of 623 respondents aged 13 to 39, including 521 females (83.6%). All of these respondents were Internet users who go online “several times a week” (n = 6, 1%), “almost daily” (n = 62, 10%), and “daily” (n = 554, 88.9%).

Measures

Usage of nutrition, weight loss, and fitness websites. The frequency of use was measured by the question “How often do you visit websites regarding nutrition, weight loss, or exercise and sport?” with answers on a 6-point scale with the response options: 1 (Never), 2 (Almost never), 3 (Several times a month), 4 (Several times a week), 5 (Almost daily), and 6 (Daily). Respondents answered with regard to three types of websites, i.e. those focused on “Nutrition (e.g., relating to specific diets, healthy meals, etc.)” (M = 4.38, SD = 1.22); “Weight loss (e.g., diets or instructions on how to lose weight)” (M = 3.04, SD = 1.44); and “fitness (regarding your exercise or sport, but not, e.g., the results of professional athletes)” (M = 4.02, SD = 1.39).

Gender and age. Gender was coded as binary (0 = males, 1 = females), and age was also requested (M = 24.11 years, SD = 5.26).

Excessive exercise. Five items from the Excessive exercise subscale from the Eating Pathology Symptoms Inventory Scales (EPSI) [33] answered on a 5-point scale ranging from 1 (Never) to 5 (Very often) were used. The scale was computed by averaging the items, with higher scores indicating greater tendency for excessive exercise; M = 3.05, SD = 0.96, α = .87.
Eating disorder symptomatology. The SCOFF screening tool [34] consisting of five items with Yes/No response options was used to identify a group of respondents potentially at risk of eating disorders. Those answering “Yes” on two or more items were classified as respondents at risk of having an eating disorder, \( n = 294 \) (47.2%).

Weight status. The respondents reported their current height (in centimeters) and weight (in kilograms), which were used to calculate their BMI (kg/m\(^2\)). Weight status data were then obtained using international cut-off points for adults [35], and adolescents [36]. Respondents were classified as either being “Underweight” \( (n = 40, 6\%) \), having “Normal Weight” \( (n = 438, 70.3\%) \), and being “Overweight” or “Obese” \( (n = 145, 23.3\%) \).

Internalization of the beauty ideal. Respondents were asked “To what extent do the following statements apply to you in regards to these sites?”, with three items adapted from Cusumano and Thompson (2001): “I am comparing my appearance with people on these sites”, “I am trying to look like the people on these sites”, and “The content on these sites inspire me in how to look attractive”. The items were answered on a 4-point scale ranging from 1 (Definitely does not apply) to 4 (Definitely applies). The scale was computed by averaging the items, with higher scores indicating higher internalization; \( M = 2.34, SD = 0.90, \alpha = .82 \).

Perceived online social support. Respondents were asked “To what extent do the following statements apply to you with regard to these sites?”, with three items adapted from Graham, Papandonatos, Kang, Moreno, and Abrams (2011): “I get advice and support here that I would not get elsewhere”, “It is encouraging to know that there are other people making similar efforts (with regard to nutrition or sport)”, and “I feel that other visitors (or authors) of sites are giving me support”. The items were answered on a 4-point scale ranging from 1 (Definitely does
not apply) to 4 (Definitely applies). The scale was computed by averaging the items, with higher scores indicating higher perceived support; $M = 2.80$, $SD = 0.74$, $\alpha = .72$.

**Statistical analysis**

To assess the links between the studied factors, we tested a base linear regression model with observed variables in which we predicted all three outcomes (using MLR estimator in Mplus7). All paths between predictors and outcomes were allowed; weight status was included as a dummy variable with a reference category “normal weight”. In the second step, we constrained all nonsignificant ($p < .05$) paths to zero.

**Results**

Results of the base linear regression model are shown below (Table 1).

**Table 1. Base regression model predicting the frequency of the usage of nutrition, weight loss, and fitness websites.**

<table>
<thead>
<tr>
<th></th>
<th>Nutrition $\beta$</th>
<th>Nutrition $p$</th>
<th>Weight loss $\beta$</th>
<th>Weight loss $p$</th>
<th>Fitness $\beta$</th>
<th>Fitness $p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (females)</td>
<td>.211</td>
<td>&lt; .001</td>
<td>.184</td>
<td>&lt; .001</td>
<td>.004</td>
<td>.895</td>
</tr>
<tr>
<td>Age</td>
<td>.003</td>
<td>.933</td>
<td>.082</td>
<td>.015</td>
<td>.092</td>
<td>.006</td>
</tr>
<tr>
<td>Eating disorder symptomatology</td>
<td>.053</td>
<td>.154</td>
<td>.165</td>
<td>&lt; .001</td>
<td>-.049</td>
<td>.139</td>
</tr>
<tr>
<td>Excessive exercise</td>
<td>.277</td>
<td>&lt; .001</td>
<td>.257</td>
<td>&lt; .001</td>
<td>.570</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>BMI – underweight (vs. normal)</td>
<td>.066</td>
<td>.060</td>
<td>-.003</td>
<td>.939</td>
<td>.032</td>
<td>.354</td>
</tr>
<tr>
<td>BMI – overweight (vs. normal)</td>
<td>.026</td>
<td>.492</td>
<td>.152</td>
<td>&lt; .001</td>
<td>.011</td>
<td>.727</td>
</tr>
<tr>
<td>Internalization</td>
<td>-.079</td>
<td>.071</td>
<td>.190</td>
<td>&lt; .001</td>
<td>.129</td>
<td>.001</td>
</tr>
<tr>
<td>Perceived online social support</td>
<td>.320</td>
<td>&lt; .001</td>
<td>.110</td>
<td>.002</td>
<td>.063</td>
<td>.049</td>
</tr>
</tbody>
</table>

The final model (Figure 1) had an acceptable fit, $\chi^2 = 14.01$, $p = .173$, $RMSEA = .03$, $CFI = .99$, $TLI = .99$. The more frequent visits of nutrition websites were positively predicted by being female and having higher excessive exercise and higher perceived online social support.
The visits of weight loss websites were predicted by being female and having higher excessive exercise, higher internalization, higher perceived online social support, eating disorder symptomatology, and being overweight (as opposed as to having normal weight); the effect of age was significant but negligible ($\beta = .083$). The visits of fitness-oriented websites were positively predicted only by higher excessive exercise and higher internalization; the effect of age was again significant but negligible ($\beta = .095$) and the effect of perceived online social support was not significant in the final model ($p = .078$).

**Figure 1.** Final model predicting the frequency of the usage of nutrition, weight loss, and fitness websites.

Note. **$p < .001$, *$p < .01$** (exact $p$ values $< .01$ are reported above within the text); standardized coefficients are presented; effects with $\beta < .10$ are dashed.

**Discussion**

The aim of this study was to explore the individual factors that are associated with the frequency of the usage of nutrition, weight loss, and fitness websites. Specifically, we examined
the association with sociodemographic variables (gender and age), eating disorder symptomatology, weight status, levels of excessive exercise, levels of internalization, and levels of perceived social support from other website users.

**Usage of nutrition websites**

Being female, higher levels of excessive exercise, and perceived online social support were positively associated with the usage of nutrition websites. Considering the lack of association with the internalization of the beauty ideal and eating disorder symptomatology, the usage of nutrition websites could be motivated more for health orientation rather than for looking attractive and/or appearance-based social comparisons. Orientation toward a healthier lifestyle could also explain the association between excessive exercise and the usage of nutrition websites, although this association remains largely unexplored. For instance, healthy lifestyle activism on the Internet, as well as in mainstream women’s health media, usually depicts inspirational images to encourage the pursuit of a healthy diet and fitspirational images of women participating in the latest fitness craze, such as yoga [39]. Moreover, our finding that the usage of these websites is more frequent among women also corresponds with this interpretation and prior findings. For instance, a previous study [4] found that women are more likely than men to use the Internet as a source for nutrition and dietary information. There is a global trend among some young women, including Czech women, to pursue a healthier lifestyle by improving their diet, nutrition, and fitness [40]. In this sense, the Internet and specifically nutrition-oriented websites can represent an important and easily-accessible source of information. Qualitative studies suggest that dietary information on the Internet, such as on blogs and social media, is found to be very useful for Internet users given that they can find recipe ideas and social support to have a healthier diet and/or to pursue a healthier lifestyle [13,41].
However, the use of nutrition websites to pursue a healthier diet raises questions about the accuracy, quality, and impact of the health-related nutrition information. For instance, health communication among online users may be contaminated by inaccurate health information that they find on the Internet and/or by health beliefs originated by the misinterpretation of the information [5,42]. Thus, considering the uncertain quality of online health information, more research attention should be paid to the process of the evaluation and the selection of this information in order to prevent negative health consequences.

**Usage of weight loss websites**

The usage of weight loss websites was positively associated with excessive exercise, internalization, being female, eating disorder symptomatology, and being overweight or obese. The usage of weight loss websites was also connected to age and online social support, although very weakly. Weight loss concerns are widespread among young women [43], and particularly among those with higher levels of internalization, those who are overweight, and those with disordered eating behavior [44,45]. This can explain why the usage of weight loss websites in our sample was associated with being female, being overweight or obese, higher internalization, and eating disorder symptomatology. Similarly, excessive exercise is associated with weight loss because it is frequently used for weight-control purposes, and it is a common compensatory behavior among people with eating disorder symptomatology [46]. Taking all these individual factors together, it is possible that the underlying motivational factor for using these weight loss websites was body image concerns and particularly body weight concerns, which is a finding consistent with the literature [47]. Moreover, weight loss websites are usually overloaded with information and advertising about fad diets [48]. It has been found that women who obtain weight loss information from the Internet are more likely to exhibit unhealthy weight control
behaviors [14]. Therefore, individuals’ concerns about body image, eating, and weight could have a bidirectional association with their own usage of weight loss websites, and their selective exposure (deliberately or not) to this kind of media information may shape their own media effects [28]. Thus, the selective exposure to weight loss information and its effect on disordered eating is definitively a venue for future research. Finally, it is important to note that Internet users with individual characteristics, such as weight concerns, eating disorder symptomatology, and excessive exercise, are more likely to upload thinspirational content (i.e., to promote weight loss), as well as fitspirational content [29]. In turn, through psychological mechanisms, such as observational learning [27], viewers of this content may feel inspired to pursue the “thin-ideal body” and to adopt unhealthy weight control behaviors. Thus, media literacy interventions aimed at promoting a critical examination of media messages regarding nutrition, weight loss, and fitness, may serve as a useful public health initiative to ameliorate the potential harmful effects of these kinds of messages [49].

**Usage of fitness websites**

The strongest association we found was between the levels of excessive exercise and fitness website usage. Moreover, fitness website usage was associated with internalization (although this association was lower) and with the frequency of Internet use (although this association was close to zero). Following the selective exposure model [50], it could be suggested that individuals who engage in excessive exercise use fitness websites more frequently because the content on these websites is consistent with their beliefs and it can reinforce these beliefs [51]. In this sense, the role of internalization is quite interesting. For instance, future research can examine how selective exposure to fitness websites among individuals with high levels of excessive exercise may influence internalization as an enduring disposition or trait
rather than as a state [45]. This approach would also contribute to further understanding the role of individual differences in the study of media effects [52].

**Differences among individual factors associated with the usage of nutrition, weight loss, and fitness websites**

Concerning sociodemographic factors, we found only a weak association between age and the usage of weight loss and fitness websites, which could be due to the characteristics of our sampling procedure because it was focused on a younger population (13 to 39 years). On the other hand, being female was associated with the higher usage of nutrition websites and weight loss websites, which seems to have been a consistent finding in recent surveys [3,4]. However, there was no link between gender and the frequency of use of fitness websites. Previous studies on Internet use regarding diet, weight, and physical activity have found secular trends by gender, suggesting changes over time regarding gender differences in Internet use [3]. Moreover, there are seasonal and geographical variations regarding physical activity and dieting [53,54], and these variations probably influence the usage of fitness and weight loss websites. Therefore, certain sociodemographic characteristics associated with the usage of nutrition, weight loss, and fitness websites can change over time and place, reflecting the dynamism of Internet use. Future research should further investigate this dynamic aspect of health-related Internet use and the sociodemographic characteristics associated with it, which may be useful in the design of health communication campaigns.

Concerning individual factors, excessive exercise was moderately associated with all three types of websites. Excessive exercise is not exclusive to individuals with eating disorders and individuals participating in a physical activity or sport. The apparently healthy fitness activities like yoga, Crossfit (see: crossfit.com), or Zumba (see: zumba.com) may lead to
problematic exercise patterns due to diverse reasons, such as personality traits like perfectionism [55]. Therefore, the diverse reasons for exercise may influence the diverse motivations for the usage of nutrition, weight loss, and fitness websites. This highlights the importance of integrative approaches to health behavior and the opportunity for future studies to integrate motivational theories regarding exercise [56], health behavior [57], and Internet use [58].

Our findings also revealed that internalization was associated with the usage of weight loss and fitness websites (mostly appearance-oriented content), but not with the usage of nutrition websites. Previous literature confirms the positive association between beauty ideal internalization and the consumption of appearance-focused media [59]. But it also suggests that internalization promotes body-change behaviors aimed at achieving the beauty ideal [45], including higher levels of physical activity and compulsive exercise [60]. Thus, this could suggest that beauty ideal internalization is mostly associated with the consumption of appearance-based online media (e.g., fitness and weight loss websites) rather than health-oriented online media (e.g., nutrition websites). Nevertheless, further research is warranted to confirm this hypothesis.

Finally, perceived online social support was not associated with the usage of fitness websites, but it was associated with the usage of nutrition websites and weight loss websites, although this latter association was weak. As mentioned above, nutrition websites usually provide information regarding specific diets and healthy meals as well as social interactions that Internet users find very useful for their eating and dietary needs and goals [13,41]. On the other hand, it should be noted that privacy attitudes are important in online health communication, particularly regarding the self-disclosure of body weight and weight loss concerns. For instance, anonymity is easier online compared to offline peer-to-peer communication, and studies have
found that this anonymity in the online context provides an opportunity for shared self-disclosure of eating and weight loss concerns among members of online communities and blog users [61]. Therefore, the results of our sample suggest that social support is particularly relevant in regard to the usage of nutrition websites and to some extent the usage of weight loss websites, but most probably not relevant regarding the usage of fitness websites.

**Limitations**

Nevertheless, it is important to note that our study has some limitations. First, we explored the frequency of the usage of nutrition, weight loss, and fitness websites but not the specific health behavior potentially related to these visits, such as the use of misinformation obtained from these websites. Thus, it would be beneficial to know more about how health-related information from these websites is actually used. Also, the items covered general patterns of visits to the three measured types of websites. However, it is probable that in some cases the visited websites could be defined by two or all three types. The data are also self-reported, a limitation which needs to be considered with regard to the actual frequency of the visits (as compared to the recalled and reported one) as well as with eating disorder symptomatology, body weight, and height. Our sample is also limited in terms of generalizability considering, for instance, that women were overrepresented and underweight individuals were underrepresented. Finally, the cross-sectional and correlational nature of our data preclude causal interpretations.

Although our study has limitations, it also has strengths. For instance, we asked participants about their frequency of use of specific websites rather than just asking them about online health information seeking. Moreover, this was a population-based survey that included diverse participants of both genders rather than a specific sample such as female college students.
Acknowledgments

[Blinded for review]

Conflicts of Interest

None to declare.

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