Spreading Misinformation on Exercise and Health: Analysis of Instagram´s Profiles

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Abstract

Instagram (IG) reaches millions of people, sharing personal content, and also all kinds of information, including those related to exercise and health. However, scientific quality of the posted information is questionable. Thus, this study aimed at analyzing whether exercise and health information posted by main IG Brazilian influencers have technical-scientific accuracy. A personal IG account was created to identify Brazilian IG profiles. The inclusion criteria of the accounts were: 1) having 50% of all the shared posts indeed related to topics about exercise and health, such as nutrition, health and wellness, medicine and/or physical fitness; and 2) having over followers 100,000. A qualitative analysis revealed that ~75% of the account´s administrators were academically/professionally qualified. However, out of all the posts, only 13 (~2.7%) cited a reference endorsing the information. Moreover, the higher quality of the posts was directly associated with the higher educational qualification of the influencers (r=0.451; p<0.01). Nevertheless, the number of followers was inversely correlated with the educational qualification of the influencers (r=-0.450; p<0.01) and quality of the posts (r=-0.348; p=0.047). We conclude that main IG Brazilian influencers disseminate low-quality information about exercise and health, contributing to the wide-spreading of misinformation to millions of followers.

Introduction

In the last years, obtaining high-quality technical information moved from scientific conferences or college classes to web-based resources, making these tools extremely popular\(^1\). The low cost and the potential high reach, which makes web-based channels suitable to obtain prompt information\(^2\), may explain their popularity.

Social media platforms (SMP), such as Facebook, Twitter and Instagram (IG) became part of people´s daily life. Facebook has more than two billion active users, while IG reached one billion users, being the second more popular among young people. Seventy one percent of its users are around 34 years old or younger, compared to 22% and 40 % of Facebook and Twitter users, respectively\(^2\).

IG, a SMP exclusively dedicated to posting and sharing pictures and videos attached to brief texts as captions, allows users to create personal profiles to spread their own pictures and private information and to easily interact with other users (i.e., followers). The followers receive real-time notifications from the influencer’s accounts\(^3\).

Although originally the main purpose of these SMP was to keep friends and family in touch\(^2,4\), or to provide access to personal information of celebrities\(^2\), the focus of these SMP have been changing and evolving to all sorts of disclosures, including those related to exercise and health interventions. Such scenario favoured the thrive of IG because of its emphasis on image, which is more visually appealing\(^5\). In this context, the term Fitspiration (merger of the words fitness and inspiration), which refers to images, videos and/or texts posted to motivate people on either to exercise or to adopt a healthier lifestyle, has gained evidence\(^6\). Fitspiration main focus is on propagating information related
tobenefits in health and in well-being by encouraging healthy eating and exercise practicing. Fitspiration is found on a large range of sites and SMPs, being most common on IG. It allow the users to “tag” their posts with identified words, making search for themed content easy. A quick search for the hashtags ´Fitspiration’, and its shortened form ´Fitspo’, returns over 90 million posts on IG.

Although Fitspiration and its related terms intend to promote positive social influence regarding exercise and health, several aspects about the technical quality of the information posted by the influencers can be questioned. One important facet is that many shared posts are simply an influencer’s mere opinion, experience or marketing, frequently not supported by scientific evidence. Combined with a body-shaped image and enviable lifestyle publicity, as well as with targeted communication techniques, this set of actions create a based-dependency relationship between influencer and follower. Also, influencers encourage the consumption of supplements, or the wear of fitting branded sportswear as a requirement to achieve the ideal body, conveying the impression that appearance is the key factor to success and happiness. These actions, instead of promoting health, may become detrimental to the follower’s life.

The dissemination of misinformation related to Fitspiration became widespread in a faster way than the real one. However, there is no standard tool to assess the accuracy and reliability of these disseminated contents. Considering that low-quality information may influence followers to adopt a damaging behavior regarding exercise and health and, consequently, increase the risk of potential health damage, evaluating the quality of SMP information becomes relevant. Although SMP have a massive approach worldwide, there is limited evidence about the scientific reliability of the information spread from them. Thus, this study aimed at analyzing whether exercise and health information posted by main IG Brazilian influencers have technical-scientific accuracy. Because instantly published content does not undergo any kind of technical-scientific review or peer-review process, we hypothesized that the shared information in the posts lack technical-scientific credibility, contributing to the promotion of misinformation.

Results

Thirty-three IG accounts were included in the analysis, reaching an average of 30 million followers. Fifteen posts per account were analyzed, totalizing 495 posts.

The posts presented an overall average of 8,597 likes and/or views. Table 1 presents the total number of posts in parallel with the likes and/or views of all five categories of publication’s formats.
Table 1
Total number of posts, likes and views according to all five categories of publication’s formats.

| Posts (nº) | Likes (nº) | Likes/post |
|------------|------------|------------|
| Picture    | 197        | 1259281    | 6392.3     |
| Video      | 212        | 2543013    | 11995.3    |
| Text       | 2          | 26628      | 13314      |
| Picture/Text| 84         | 360902     | 4296.5     |
| Video/Text | 2          | 4735       | 2367.5     |

The stratification of all posts according to the four major knowledge areas is depicted in Fig. 1. The majority number of posts approached the nutrition and the physical fitness topics. However, while most of the posts about nutrition were informative, the posts about physical fitness had teaching as main purpose (Fig. 1A). Figure 1B shows that informative posts about nutrition caught more the attention of the followers in terms of likes. The number of likes were higher in comment posts about physical fitness. Table 2 shows the academic/professional qualification of the influencers. It should be emphasized that 75.8% of all the account’s administrators had an academic/professional qualification. The analysis also revealed that all influencers uploaded at least one post outside the knowledge area of their academic/professional qualification (i.e., a nutritionist posting information about exercise prescription, data not shown).

Table 2
Academic/professional qualification of IG account’s administrators.

| Academic/professional qualification | Quantification | B.Sc. | Specialist | M.Sc | D.Sc/Ph.D |
|-------------------------------------|----------------|-------|------------|------|------------|
| Medical doctor                      | 4              | -     | 2          | 2    | -          |
| Nutritionist                        | 10             | 6     | 1          | 1    | 2          |
| Pharmacist                          | 1              | -     | -          | -    | 1          |
| Sport Sciences/Kinesiology          | 9              | 5     | 1          | 1    | 2          |
| Physiotherapist                     | 1              | -     | -          | -    | 1          |
| Without professional qualification  | 8              | -     | -          | -    | -          |

B.Sc., bachelor of science; M.Sc., master of science; D.Sc./Ph.D., doctor of science/philosophy doctor.

The quality criteria analysis revealed that ~75% of the account’s administrators were academically/professionally qualified to provide information on the mentioned topic (QC1) (Table 3).
Nevertheless, only ~19% of the posts cited a scientific reference (QC2). Out of this total (95 posts), only 13 posts cited a reference that indeed endorsed its information (QC3). In terms of viability (QC4), ~44% of the posts shared information that was scientifically proven to be viable to execute and useful for the general public. Table 3 also shows that the accounts presented a 23% quality score as calculated by Eq. 1.

Table 3
Qualitative analysis of Instagram accounts and selected posts.

| QC1 (account) | QC2 (post) | QC3 (post) | QC4 (post) | Quality-ratio score* (account + post) |
|--------------|-----------|-----------|-----------|--------------------------------------|
| Account (n)  | Score     | Posts (n) | Score     | Posts (n) | Score     | Posts (n) | Score     | Maximum | Mean Score (%) |
| 33           | 25        | 495       | 95        | 495       | 13        | 495       | 217       | 1518    | 350(23)         |

Data are presented as total score possible and achieved. QC, quality criteria. *The maximum possible score is 1518, which is equal to 100% of the quality criteria (Eq. 1).

Table 4 presents correlations between followers, number of likes and/or views, academic/professional qualification and quality of the posts. A positive correlation was found between the academic/professional qualification of the account’s administrator and the quality of the posts. However, the number of followers was inversely correlated with academic/professional qualification of the influencers and the quality of the posts.

Table 4
Spearman rank correlation among number of followers, number of likes and/or views, academic/professional qualification of the influencers and quality of the posts.

| Number of likes/views | Academic/Professional qualification of the influencers | Quality of posts |
|-----------------------|------------------------------------------------------|------------------|
| Number of followers   | 0.604**                                              | -0.450**         | -0.348*         |
| Number of likes/views |                                                      | -0.105           | -0.245           |
| Academic/Professional qualification of the influencers | - | - | 0.451** |

*p < 0.05; **p < 0.01

Discussion

The main objective of this study was to analyze whether information from main IG Brazilian influencers, who disseminate information related to exercise and health fields have technical-scientific support. Our main finding is that most IG influencers provide inaccurate information, as indicated by the lack of posts supported by a scientific reference. From the 495 analyzed posts, only 13 (~2.7%) cited a reference that
actually endorsed its information. Moreover, even though the influencers have an academic/professional degree, their accounts presented a quality score as low as 23%. Nevertheless, these post’s misinformation directly reaches a large audience of about 30 million people. Thus, this study provides evidence that main Brazilian IG influencers related to exercise and health share low-quality information, deficient in scientific support, even though the influencers have an academic/professional qualification.

It is important to highlight that ~75% of the investigated IG influencers have a formal academic/professional background, which supposedly capacitate them to prescribe guidelines, and, most importantly, to discern the possible negative effects of pervasiveness of the posted information on the health of the followers. Misinformation may refer to false and inaccurate information that can be deliberately or naively designed to deceive the intended recipients. Interestingly, all the administrators of the accounts evaluated herein shared at least one information beyond the scope of their academic/professional qualification. This intrusion is possibly one factor that contributed to the low-quality of the posts, as well as the low-quality score obtained by the accounts.

Regarding the quality of the posted information about exercise and health by main Brazilian influencers, data from this study revealed that the minority of them were supported by a scientific reference (13 from 495). Such finding points to the direction that the account’s administrator opinion, experience or even personal or business marketing are preferentially shared on their accounts, instead of scientifically consistent information. It is to believe that if the post is grounded by any type of reference, such as a study published in a scientific journal or a book, its content becomes much more trustworthy, supposedly increasing the credibility of the transmitted information. However, a critical concern about the use of these scientific references was raised in the present study, since only 13 posts cited scientific references indeed endorsing its information. Moreover, 82 posts referred to a reference that did not corroborate the shared information, while 400 posts did not even refer to any reference, and 217 posts could have been supported by a scientific reference but the influencers omitted themselves from citing it. All these characteristics directly contributed to the low-quality score obtained by the accounts, as indicated by the positive correlation between the academic/professional qualification of the account’s administrator and the quality of the posts. Moreover, the last two aspects mentioned above seemingly suggest that either the administrators claim something completely distorted from the reasoning of the reference (for example, share an information about exercise, but cite a scientific reference about supplements) nor do they care to share a reliable information with their followers at all. The reason why so many of these popular influencers risk their credibility by sharing not scientifically based information is a matter a debate; however, the financial benefit of promoting a fake solution or product should be taken into account.

The events mentioned above ultimately support misinformation dissemination as it reaches a large audience, generating an apprehension due to its implications to the public. This is reinforced by the fact that the global impact of SMP became large among the population, and, therefore, the information provided by its platforms can directly influence the daily routine of a great amount of people. By following a particular influencer, users may find themselves copying their habits, as well as adopting their
advices on a daily basis⁸. It should be also mentioned that IG provides a sharing option from the original source, using another specific smartphone app. Therefore, the number of people who have access to a single misinformation can increase exponentially, in the case of this study, up to more than 30 million people.

Another aggravating is the negative correlation observed between the number of followers and the influencer’s qualification and the quality of the posts, which means that the less qualified, the more followers the influencer has, and lesser is the veracity of the posts. This evidence points to the direction that the misinformation divulged by the influencers about exercise and health may negatively impact the quality of life of a great amount of people, leading to a detrimental behavior⁶. For instance, unsupervised physical exercise practice can lead to musculoskeletal injuries¹¹, and exacerbated Fitspiration promulgation may provoke dietary disturbances (bulimia and vigorexia) and mental disorders (depression and chronic anxiety)⁶. One curiosity is that ~ 44% of the posts shared information that was scientifically proven to be viable to execute and useful for the general public but the influencer was not careful enough to cite a reference do endorse it. This data leads to the believe that users may estimate and give credit to an influencer greatly because of his/her public image as a celebrity and/or athletic body shape, for example, instead of a trusted source. This also suggest that image is one of the main tools of IG. IG also allows users to like and comment on others’ posts. At the time of data collection, IG still published the number of views and likes of the posts, which allowed us to make a more consistent descriptive-quantitative analysis. After discussions over the impact of the likes and followers feature on users’ social problems and mental health, IG hid the visualization of theses parameters, even though the usernames of people who have liked the post has remained on display¹². Herein, the posts presented an overall average of 8.597 likes and/or views, which is also considered an important parameter of their influence over people. Regardless of the format, all posts received a considerable amount of likes and/or views, even those posts that predominately were images containing only written text. In fact, IG popularity among users is largely attributed to the emphasis on visual content that has been proven to be more appealing to the audience⁵. This is one important aspect since the attractive of SMP are quite based on a commercial point of view once most of the posts approaches fitness full-body, healthy eating, active exerciser and sexualization⁷. Particularly when dealing with knowledge areas that print a concept of aesthetics, such type of posts usually calls more attention of the public, but take the focus off the main information and detract from the critical sense about it.

Within the four knowledge areas evaluated in this study, the most usual ones were those related to body-shaped image, i.e. nutrition and physical fitness. More specifically, informative posts about nutrition and teaching posts about physical fitness were the most frequently shared. As indicated by the number of likes and/or views, the follower’s interests were mainly focused on comments about nutrition and explanations, descriptions and/or general information about physical fitness. These findings prove that Fitspiration is a relevant topic of great appreciation.
Although we have provided a descriptive analysis, it was not possible to identify the so-called fake followers (ghost followers purchased from third-party providers). In addition, the number of likes and comments can be manipulated with the help of automated chat bots, which is another point that we were not able to stratify.

We conclude that main IG Brazilian influencers disseminate low-quality information about exercise and health. The majority of these IG profiles present information lacking scientific support, although their administrators have an academic/professional degree. Such conduct contributes to the wide-spreading of misinformation to a large audience (i.e., millions of followers) as indicated by the negative correlation between the number of followers and the influencer’s qualification.

**Methods**

**Ethics approval and consent to participate**

This study does not require ethics approval according to international regulations, since only secondary data from open social media was analyzed. No human studies were carried out and only publicly accessible sources were used. Personal or person-related content was rendered anonymous in such a way that the identification of the subject was not possible.

**Account selection criteria**

Based on a prior correlation coefficient of 0.35, a power (1-β err prob) of 0.6 and α of 0.05, it was estimated that a total of 29 accounts were required for the analysis. A list with 50 IG accounts, presented on an ordinal scale according to the total number of followers, was provided by a specialized online digital research database service. Account selection criteria included information publish only in Portuguese language and account’s name or description with at least one of the key-words derived from the topics exercise and health: nutrition, health and wellness, medicine and/or physical fitness. From this list of accounts, only those sharing posts mentioning tips, instructions, programmes, protocols analysis or practical information were selected. Duplicate ones (with the same administration but with different account’s names) and accounts with posts related to selling (e.g., clothing, supplement, equipments or products) were excluded. Thus, 33 accounts (over 100,000 followers each), consisting of 30 males and 3 females influencers, were included in the qualitative analysis of their content.

A personal IG account was created in order to access the content of the analyzed posts of each IG account included in the study. Data was collected between August and December of 2018. Based on an original information published by each account in their stories, with a mean of 1,114,333 followers, the average reach of the content (during 30 days) was ~ 133.5 million and the interactions were ~ 109.8 million.

**Technical evaluation of influencers**
In order to verify the digital influencers qualification and whether they were qualified or authorized to provide information on exercise and health, the following characteristics were checked: a) academic or professional qualification: academic and professional degrees were checked on Google website, as well as on the Lattes platform (a Brazilian database that provides curricular information hosted by the National Council for Scientific and Technological Development and Coordination for the Improvement of Higher Education Personnel). In case such information was not found in either databases, the account’s administrator was labeled as “without professional qualification”; b) divergence between academic/professional qualification and the specific content of the published information (e.g., a nutritionist posting about exercise prescription) were also reported. From this analysis, we observed that all influencers uploaded at least one post outside the knowledge area of their academic/professional qualification. The academic and professional degrees were classified as: B.Sc., bachelor of science; M.Sc., master of science; D.Sc./Ph.D., doctor of science/philosophy doctor.

**Posts inclusion and classification**

Figure 2 shows the process of stratifying the posts. Each IG post was allocated into four knowledge areas based on the exercise and health topics: 1) Nutrition, 2) Health and wellness, 3) Medicine and 4) Physical fitness. Within areas, the posts were then classified according to 3 different purposes: 1) teach (i.e., posts that approached “how to use”, “how to execute/perform”, “how many doses to administrate”), 2) inform (i.e., posts that introduced explanations, descriptions and/or general information about a topic), and 3) comment (i.e., posts that presented technical opinion about a specific topic or thematic). The different types of posts were also separated according to the publication’s format: a) picture-image only; b) video only; c) text only (slide in the format of picture containing only written text); d) picture-text; e) video-text. The legend of each post was not considered for stratification of the different types of posts, but was included in the quality-criteria analysis. Based on the above criteria, 15 posts (collected during approximately 3 weeks, since influencers tended to upload one post almost everyday) from each IG profile were included in the study’s analysis, totalizing 495 posts. Posts about digital influencers personal lives, or those which did not fit in the knowledge areas were not included in the analyses. The total number of likes and video views of each post were also registered.

**Quality criteria assessment**

A qualitative analysis (Table 5) of all selected posts was carried out based on 4 quality criteria (QC) adapted from previous work. For the analysis, a score of 1 (in favor of QC) or 0 (against QC) was assigned to all analyzed posts. Data was reported as total achieved and percentage of maximum. Approval rate > 50% was considered acceptable. All analyses were verified by two evaluators separately. Their decision based on the 4 QC had to be in agreement, otherwise, a third evaluation was carried out by another appraiser.
Table 5
Quality criteria assessment performed on the selected accounts and posts.

| Quality Criteria                                                                 | 0 | 1 |
|----------------------------------------------------------------------------------|---|---|
| 1. Is the author academically/professionally qualified to provide information on | No | Yes |
| the mentioned topic? (whether the account´s administrators have academic or professional qualification) |
| 2. Does the author cite references? (whether the post cites a scientific reference) | No | Yes |
| 3. Are the post’s statements in agreement with the cited references? (whether the cited scientific reference endorses the post´s information) | No | Yes |
| 4. Are the post’s guidance supported by any scientific study, even if no reference was cited at all? (whether the recommendation was methodologically reasonable, based on at least one scientific study, even though the post did not cite the reference) | No | Yes |

In addition, a quality-ratio score (QRS) was proposed to establish a general framework for all accounts. This score was calculated based on the four QC, considering the 33 accounts and the 15 included posts per account. Each account could totalize a maximum of 46 points as calculated by the following equation:

$$QRS= \frac{33*(QC1 + 15*QC2 + 15*QC3 + 15*QC4)}{1518} \quad (1)$$

where QC is the quality criteria and 1518 is a constant related to the product of the total number of analyzed accounts (33) multiplied by the maximum possible score to be achieved from QC1, QC2, QC3 and QC4 (1 + 15 + 15 + 15 = 46).

Statistical analysis

Descriptive statistics was performed using Microsoft Excel (Version 2016, Microsoft, Inc., Redmond, WA, USA). Percentage of all posts were calculated in relation to the major knowledge areas. It was determined that a pass rate > 50% would be considered acceptable for the quality criteria analysis. Additionally, the normality of the data about the academic and professional qualification, the quality of the posts, the number of followers, as well as likes and views were verified using Kolmogorov-Smirnov test. The Spearman´s bivariate correlation test was performed for determination of correlations among variables. The abovementioned correlations were classified according to Hopkins criteria (www.sportsci.org) as follows: <0.1, trivial relationship; 0.1–0.3, weak; 0.3–0.5 moderate; 0.5–0.7, strong; 0.7–0.9, very strong; >0.9, nearly perfect. Level of significance adopted was $\leq 0.05$.

Declarations

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Author Contributions

The project's experimental design, investigation, the concept of the paper, data analysis, interpretation of data: MM, AM, HLRS, GRM, RAA, LL. The preparation of the manuscript: MM, HLRS, GRM, RAA, LL. Critical review of the manuscript: GRM, LL

Competing interests

The authors declare no competing interests.

Availability of data and materials

The datasets used and/or analyzed in the context of this study are available from the corresponding author on reasonable request.

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