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OUTDOOR FITNESS ACTIVITY
UNDER COVID-19 RESTRICTIONS.
WEARABLE DEVICES, IMAGES, AND POSTS
AS SOURCES OF INFORMATION ON USERS

ABSTRACT. Jakub Isański, Szymon Kupiński, Mateusz Leszkowicz, Wojciech Andrzejewski, Adam Bykowski, *Outdoor fitness activity under COVID-19 restrictions. Wearable devices, images, and posts as sources of information on users* edited by Marek Nowak, Krzysztof Bierwiaczonek, „Człowiek i Społeczeństwo" vol. LV: *Miasta w obliczu zmiany* [Cities in the face of change], Poznań 2023, pp. 115–139, Adam Mickiewicz University. ISSN 0239-3271, https://doi.org/10.14746/cis.2023.55.7.

Our study aimed to present amateur sports models during the COVID-19 restrictions on outdoor activities. We used mixed research methods: the questionnaire research data and information available through wearable devices. We investigate physical activity phenomena based on questionnaire results and existing data from a popular social networking site. Firstly, we asked respondents about their training types, rhythm, and preferences in using new technologies (wearables devices and social networks to upload and share results) in individual physical activity practices. Secondly, we also used a collection of over 11 thousand photos of 3138 users, with metadata downloaded from Instagram to compare declarations and content. The obtained data were processed using machine learning and Python software. Analyzing the results, we showed a change in the intensity of practicing three selected types of activity. We also analyzed the data set (photos, tags, and metadata) from a social network. The conclusions show the potential of triangulation of methods and data to describe the amateur physical activity and the change of these practices during COVID-19 limitations in indoor and outdoor sports.

Keywords: wearable devices, recreation, outdoor activities, mobile-tracking fitness apps, COVID-19 and outdoor activity

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Introduction

People's increased interest in maintaining health and improving the body's resistance, amateur sports, and physical activity gained new meanings because of the COVID-19 pandemic. Due to social distancing and social isolation, there are new challenges for public physical and mental health (Hwang et al., 2020), as well as outdoor physical activity (see: Ananthakrishnan et al., 2020; Gupta and Dhamija, 2020). Several restrictions related to the closure of many sports facilities, the temporary prohibition or limited access to forests and city parks, or preventing larger groups from socializing to stop the spread of COVID-19. Varying and changing quarantine regulations regarding outdoor activities, sports facilities, team sports, and individual training have significantly influenced almost everyone. As a by-product, outdoor leisure meets these regulations, and limitations also help cope with social isolation challenges.

Our research aims to learn about amateur recreational physical activity patterns using mobile applications besides pandemic restrictions. We used the questionnaire's information and data analysis from the popular social networking site: Instagram. We obtained information about our respondents' physical routines (in the first stage of the research) and information about visual representations posted on social media at that time (in the second stage). We analyzed the content of the social networking site from the same time, in the three most frequently indicated activity types by respondents: walks, running, and cycling (primary posts), as well as secondary (reposted): hashtags added to every post (metadata). We were also interested in the content based on the individuals' exposure to photographs: background context, and people detected.

The results are presented using socio-spatial data visualization with Python software to investigate and explore activity patterns. Finally, we also introduce the limitations of the data and research techniques. As a result,

we provide a body of data to discuss the use of technology in fitness and health-oriented behaviors (Molina and Sundar, 2020: 8; Murillo-Zegarra et al., 2020). The results can be treated as information about social life dynamics – the popularity of outdoor physical activity practiced in public spaces during the COVID-19 pandemic. The research results also provide information on wearable devices by people who are amateurs of physical activity.

Related work – conceptual framework

Amateur outdoor physical activities are trained by an estimated 1/3 of the general population in many Western countries (Andrews, 2016). Group and individual, charity, and corporate sports events for runners, walkers, bikers, and other activities are popular among all age groups (Stebbins, 2019; Tham et al., 2020; Lindholst et al., 2016; Qviström, 2016; Qviström et al., 2020). Before the COVID-19 pandemic hit and national or regional quarantines all over the world, millions of people participated in thousands of open-air running sports events, regular training, and social campaigns dedicated to outdoor fitness activities (e.g., to improve physical performances, conduct regular workouts, improve general well-being, bodybuilding, or muscle building: cf. Bhargava and Nabi, 2020; Molina and Sundar, 2020; Barkley et al., 2020; García-Fernández et al., 2020; Angosto et al., 2020; Chia-Chen et al., 2020; Huang and Ren, 2020). Among the reasons for popularity are inclusiveness, exceeding the age, sex, or general physical fitness barriers, and the belief that they have a significant impact on the physical and mental health of people practicing it (i.e., physical and psychological health, reduce stress and life dissatisfaction, cardio outcomes, or to reduce body fat and weight loss: cf.: Andrews, 2016; Bhargava and Nabi, 2020; Milne-Ives et al., 2020; Jomin and Takura, 2020). It is essential to be active as such, not necessarily results-oriented. Thus, amateur athletes are racing against themselves, seeking to improve past performance rather than others' performances. In addition to sports performance, other user parameters include weight loss or, for example, obesity and cardiovascular disease prevention, rehabilitation, and lifestyle diseases, such as everyday stress or obesity (Qviström, 2016; Rocío, 2020). The more, the improvement in the body's physical performance can also be monitored (Tham et al., 2020).

   Amateur outdoor physical activity is associated with mobile technologies, namely – wearable devices, with various mobile applications. Many

of them allow one to watch vital functions and systematically analyze a user's progress and compare oneself with other users, track and record training sequences, access ready-made training plans, participate in the community of people who engage in similar types of activity, or monitor other life functions, gives a massive field for their potential on-line and off-line use. The authors of studies on these issues write about e-lifestyles, listing among its elements the saturation of the context of everyday life with electronic devices (García-Fernández et al., 2020). Thanks to the growing popularity of wearable devices, mobile applications, and fitness apps, communities are created around a given type of physical activity (Chia-Chen et al., 2020) to compare and rank one's routes with other users or upload pictures and post results from the web and to share them with a selected group of users (Dickinson et al., 2018).

The penetration of mobile applications dedicated to health or fitness is estimated to be up to 50% of users, according to research, while the retention rate of mobile apps is relatively low; 20% of users use the app once only, and 21% use the app after three months of the purchase or uploading (Molina and Sundar, 2020). Users are guided by various motivations related to physical and mental health, rehabilitation or recovery, maintaining physical fitness, muscle, bodybuilding, or weight-related issues. Most of these apps allow self-monitored behaviors and workouts performed and goals attained for beginners, advanced users, or experts. The devices and apps might help analyze group leaders' influence on members' results (within-group social comparison). The effect of competition between mobile application users (between-group competitive climate) is also accessible as a reference source for upward social comparison (Zhang et al., 2020), essential in creating a competitive environment and engaging involvement. Wearable devices are gaining other new meanings, i.e., for senior users, to support them in social networking, medical assistance, health and fitness, food and drink, or visual and hearing impairment (Banskota et al., 2020). Wearable devices, also called fitness trackers (see: Molina and Sundar, 2018), have a wide range of dedicated applications and are analyzed in many scientific research methods (Tham et al., 2020). They provide information about individual users and communities, study social relations, and influence outdoor activities (Warren et al., 2017). They are promoted as a therapeutic agent, as means of facilitating general health balance, as users express their feelings and share opinions with others (Bhargava and Nabi, 2020; Honary et al., 2019), or to "provide within-group and between-group competitive climate to improve exercise participation"

(Zhang et al., 2020). There is also an area of pro-health attitudes promotion and risky behavior prevention in treating and preventing cardiovascular diseases, eating disorders, and others (Milne-Ives et al., 2020; Sycinska-Dziarnowska et al., 2020).

Additionally, mobile apps allow the uploading and sharing of unique content (photos, posts) created for fitness activities. Data on outdoor activity uploaded to Instagram are analyzed in many research areas (Tiggemann, Zaccardo 2016; Gültzow et al., 2020; Liu and Avello, 2020). The application had 854 million active users who accessed the platform monthly in 2020. Over 8.7 million Instagram users were in Poland (November 2020), and about 59.3% were women. One of its popular functions, Instagram Stories, has about 500 million active daily users, and an average user spends 50 minutes daily. The popularity of networking websites is, during the pandemic, on the rise. Social networks contain innumerable information on various topics. Therefore, the word or phrase preceded by the # (hashtag, tag) sign makes it easier to search and group them by subject, for example, photos (snapshots). In everyday practice, browsing hashtags is a way to find inspiration, e.g., to plan a trip or look for people with similar interests. It works exceptionally well in an Instagram application, mainly used for posting photos, usually, snapshots done by users' smartphones. Each uploaded photo or image has one corresponding hashtag. In practice, Instagram users use much more of them. Usually, 5 to 20 hashtags. The upper limit of this range ensures reaching a more significant number of users. Hashtags are essential to the recipient, allowing one to observe interest areas, not just the users' angles. As described in the literature: "as a visual-locative social medium, Instagram can be regarded as a participatory sensing system" (Boy and Uitermark, 2016: 1). Thanks to this, exciting topics appear in the so-called 'feed', i.e., the main screen's content, based on hashtags and image analysis. Despite the substantial increase in people's interest in wearable devices, there is a lack of studies analyzing everyday use practices and the broader social context.

Method

To analyze wearable devices use, we planned a two-stage research process to investigate our study's area of interest – outdoor fitness activity during COVID-19 restrictions. We sourced two datasets intertwining in a timeframe: 23rd October and 11th November 2020, with retrospective reflections

on the same activities and year-over-year change. 259 valid questionnaires were analyzed and selected from the 272 collected. To avoid repetition, we confirmed the respondents' identity by e-mail tracking. In the first part, the pilot study, we conducted an online survey, disseminating our questionnaire (using the snowball technique) to amateur sports enthusiasts. The questionnaires were available in the Polish language only. It consists of closed and open-ended questions; the Likert scale was adopted for the self-esteem question 5-point. A pretest stage was conducted to test the questions' quality and improve the metric data. Out of the cafeteria of 20 activities, the three most frequently declared ones were: walks, running, and cycling. For further analysis, in the second stage of our study, we stored publicly available 6 556 posts with 11 575 images and 20 920 hashtags described with one of the following Polish language hashtags: #spacery, #biegam, #rowery (English: #walks, #running, and #bicycles) on Instagram website. We used the YOLO v5 object detection system trained on the COCO dataset (Tsung-Yi et al., 2015). The automatic object detection and classification were then performed to analyze tags in-depth and build charts and graphs. Based on the density analysis (drawn based on their frequency of occurrence), we created a list of titles, which we then analyzed. This process aimed to collect data on amateur physical activity using wearable devices during a selected time to build a data corpus to analyze human spatial movement patterns under the constraints of facing the COVID-19 pandemic.

The survey results showed a wide range of selected activities immediately preceding the survey (respondents were asked about their activities in the month prior to the study and the previous year). The impact of limitations resulting from the COVID-19 pandemic on the change in activity patterns was also visible here – in almost all types of activity, we noted a decrease in the frequency of their practice outside of work-out (indoor) and three types of outdoor activity: running, cycling and walking (see appendix 1). The study reveals that the respondents' motivation behind their physical activity varies (see Fig. 1). The reasons are dominated by those related to the physical context (fitness, general health); however, respondents also selected mental health motivations. It is also interesting to note that the physical activity itself is reported by many other fitness-oriented habits, such as a special diet or purchasing professional clothes or equipment declared by respondents. Other essential elements of these treatments are the interest in other users' results, dedicated websites or sports portals, and participation in various communities (online and on-site) focused

on physical activity. All this indicates that the undertaken physical activities can be treated more broadly as part of a lifestyle. Besides the cultivated activities, it includes a specialist diet, sports clothes, and equipment needed to practice a selected sport. Others compete in amateur sports events or belong to any online community. These regularly do sports activities, share results, and watch others' actions, staying current.
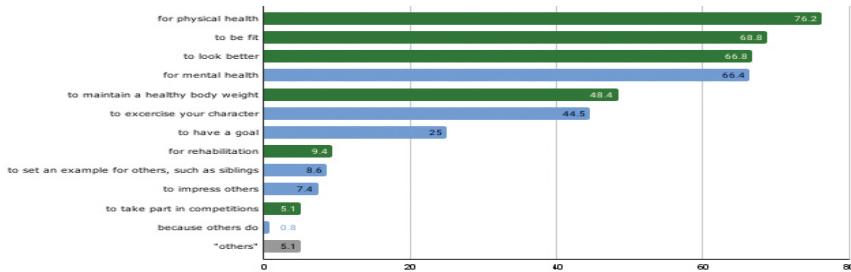

Fig. 1. *Why do you do physical activity, sports?*
(you can choose more than one answer)

Data in %, *N* = 256 responses, the green color in charts indicates physical aspects,
the blue – mental ones.

Source: own research.

Further statistical analysis showed that the vast majority of the respondents could be considered amateurs in cycling and running; at the same time, outdoor walks were declared by all the respondents (see: Appendix 1). Our study shows a high density of wearable devices used in the sample: 91% of respondents, women, and 81,8% of men declared smartphone use during their activities. About half of them use mobile apps in the three mentioned activity types, while those who rated their physical fitness the highest – this percentage is 50%. It is also worth adding the answers to sports and physical activities during which the respondents use mobile apps: running (45.9%), cycling (37.6%), and walking (33.2%). Since all these activities are related to spatial mobility, it can be assumed that monitoring performance in the field is one of the essential advantages of user assessment.

In the questionnaire, the respondents were asked to compare the scale of their physical activity (sports or recreational) in a given month and compare it with the year preceding the survey. The results show a high dynamics of their training in selected segments (Fig. 2). In contrast, some activities were performed 'this month' (October and November 2020) more often than in the year-over-year change (before the COVID-19 limitations occurred). This effect applies to walking, workout, dancing, and the broader

category 'other'. Concerning the distribution of the trend in individual types of activity, for example, apart from skating, in all these categories we can see an increase in popularity in the indications 'this year'. However, a significant decrease in the frequency of practicing them on a scale of the last month occurred. This can be attributed to the restrictions on the use of indoor facilities (such as gyms, swimming pools, indoor ice rinks, or stadiums) and the restrictions on the opportunity of gathering and do any outdoor team activity.

Fig. 2. Physical activities: last year vs. month
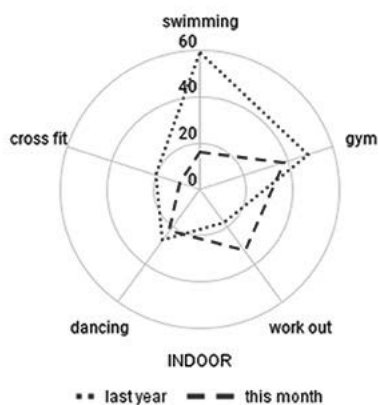
Source: own research.

Fig. 3. Indoor activities practiced last year vs. this month
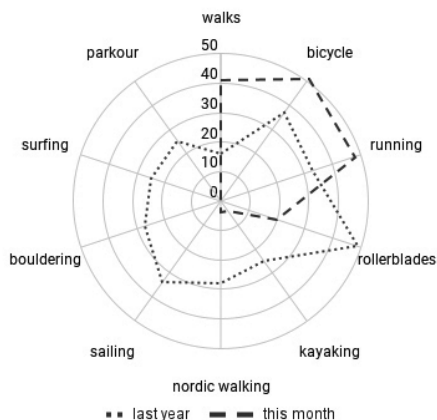
Source: own research.

Fig. 4. Outdoor activities last year vs. this month

Source: own research.

The declared indoor and outdoor activities allow observing the change before and after COVID-19 hit in 2020. An increase in the frequency of activities related to individually performed workouts is visible in the frequency of indoor exercise. On the other hand, there is a noticeable increase in the frequency of cycling, walking, and running in the case of outdoor activities. All types of sports, sports, and recreational activities chosen by the respondents are also presented on the above charts (see Fig. 2, 3, and 4). The decline in activity related to infrastructure results from the regulations mentioned earlier, resulting from the spread of COVID-19 infections. However, walking, running, and cycling increase can be observed.

On the one hand, these activities are individually practiced outdoors, so they do not raise social distance concerns. Considerable interest in these activities resulted in crowding in places where these activities could be practiced, especially in urban areas. We analyzed photos and posted content on popular social networks to investigate this phenomenon further. In the most frequently selected activities, respondents most often declare mobile applications and various devices to monitor results (smartphones, followed by smartwatches, smartbands, webcams, and other devices).

Social networking site content study: tags and images

In the second stage of the research, 25 064 files – images, post descriptions, video posts, and metadata- were obtained based on Internet users' activity on a popular social networking site. The timeframe was selected as in the first survey study (October–November 2020). The downloaded photos were exported to a spreadsheet for further analysis. The images ($N = 11\ 575$) were described with the frequency of the three mentioned hashtags: #walks, #run, #bicycles (in Polish: #spacery, #biegam, #rowery). Due to technical limitations concerning download limits and the wish to avoid analyzing posts containing, for example, advertisements for sports equipment and outfits, it has been decided to limit the data set by selecting specific tags (#run instead of #running, #bicycles instead of #bike). These tags were chosen based on analyzing the number of posts tagged with them and the photographs' content. Due to the technical problem of downloading data, 0.58% of the posts from the dataset for the hashtag' #bicycles' were incomplete, i.e., some of the text's hashtags were missing or not present. For the dataset for the hashtag' #run', incomplete posts constituted 2.39%; for the dataset' #walks', it was 2.58%.

Preliminary analysis showed that they were optimal for excluding advertising or sponsored posts. The posts of 3138 unique users were analyzed, of which only the majority showed activity in only one domain based on a Venn diagram analysis. The Venn diagram (see Fig. 5) shows the proportions of users posting with the leading hashtags (i.e., #run /PL: #biegam, #walks /PL: spacery, #bicycles /PL: #rowery). The intersections of the collections in the diagram constitute users who published posts with more than one hashtag, e.g., 18 users published posts with the '#bicycles' and '#run' hashtags.

Table 1. A number of individual users, their posts, and images
in three selected hashtags: #walks, #bicycles and #run

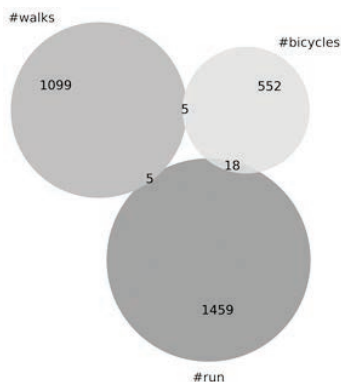|	#walks (#spacery)	#bicycles (#rowery)	#run (#biegam)	Total
Users	1109	575	1482	**3138**
Posts	1510	1033	4013	**6556**
Images	2655	2052	6868	**11575**

Source: own research.

Fig. 5. Venn diagram for users, each circle represents a set
of users posting each hashtag

Source: own research.

In the analyzed body of tags and images, posts with tag #run appeared in the analyzed period 4013 times (with 6868 photos), #walks – 1510 (with 2655 images), and #bicycles – 1033 (with 2052 images). Polish expressions were recognized and translated into English. In the case of terms that consisted of more than one word, they were separated before translation (i.e., 'biegambolubie' to 'biegam bo lubię' and translated: 'I run because I like'). The analysis of the content of hashtag pairs showed differences between describing the analyzed types of activity. The content individually concerned the action (e.g., 'I run because I like it'). In cycling, the tags' content discussed the activity and the group context – belonging to the community of people undertaking this activity (e.g., bikes, cycling). However, there were references to the natural environment and the year's season in the tags concerning walks and the activity itself. The sample graph with the hashtags' structure (see Fig. 6) presents the occurrence density (pairs of hashtags) and ties. The photos described #walks were described differently than the others – they refer to walking and the broader context of nature and landscape (e.g., autumn, forest, nature).

The content of all images was automatically analyzed using the mentioned YOLO v5 method. The table below shows the most common classes of objects in each set of photos expressed in the percentage of images containing, i.e., given type items. Essential information also concerns the detection of things in the pictures: objects classified as 'person' represent the majority of all detections in the photos tagged

Fig. 6. #I run #biegam (#I run) graphic presentation of structure
of pairs of hashtags of 5% most frequent pairs

Source: own research.

Fig. 7. Hashtags: #biegam (#I run) graphic presentation of structure of pairs
of hashtags of 20 most frequent pairs

Source: own research.

#run (54.58%), in the images tagged #walks and #bicycles, people occur less frequently (respectively 37.69%, and 33,9%, see Tab. 2). It should also be noted the differences between the methods of photo background composition for the three analyzed tags: fauna ('a bird': 6.36% for #walks and 3.1% for #running and 2% for #bicycles; similarly for 'a dog': 4.46% for #walks, 1.48% for #run, 0.42% #bicycles), infrastructure – the so-called small urban architecture: 'benches' (6.14% for #walks, 2.66% for #run and 2.05% for #bicycles). Therefore, the 'walks' category indicates more significant interest in the landscape elements than in the two other types of activity, running and cycling – as shown by the analysis of the content of secondary hashtags (see appendixes 2, 3 and 4).

Besides analyzing expressions in hashtags, the content of all images was automatically analyzed using the YOLO method. The table above (Tab. 2) shows the most common classes of objects in each set of photos expressed in the percentage of images containing objects of the given type. Exciting information also concerns detecting objects in the pictures: people are in almost all analyzed photos. In the case of photos tagged with #bicycles, more than half of them (56%) have a bike.

Table 2. Most frequent object classes detected by the YOLO v5 method for each hashtag. 'N' columns present the number of detected objects in listed classes for each hashtag, while '%' columns present percent of all detected objects in the particular set

COCO Object	#bicycles		#walks		#run	
	N	*%*	*N*	*%*	*N*	*%*
Person	2329	33.90	2394	37.69	8048	54.58
Bicycle	1839	26.77	61	0.96	109	0.74
Car	254	3.70	332	5.23	803	5.45
Bird	138	2.00	404	6.36	456	3.10
Apple	91	1.32	321	5.05	352	2.39
Dog	29	0.42	283	4.46	218	1.48
Bench	141	2.05	390	6.14	392	2.66
Bottle	379	5.52	46	0.73	199	1.35
Cell phone	50	0.73	37	0.58	209	1.42
Potted plant	148	2.15	170	2.68	187	1.27

Source: own research.

Table 3. Number of photos containing groups of people
detected by the Yolo v5 method for each hashtags, $p \geq 0.25$

Number of people detected	#bicycle		#walks		#run	
	N	*%*	*N*	*%*	*N*	*%*
0	1090	53.12	1544	58.15	2603	37.90
1	536	26.12	684	25.76	3091	45.01
2	186	9.06	213	8.02	554	8.07
3	82	4.00	70	2.64	201	2.93
4	45	2.19	39	1.47	106	1.54
5	31	1.51	20	0.75	71	1.03
> 5	82	4.00	85	3.21	242	3.52

Source: own research.

The average number of posts for each of the three analyzed tags was the highest in #run (2.7 posts per person) compared to 1.79 for #bicycle and 1.39 for #walks. Similarly, in the case of photos posted on the Internet, runners added the most, more than 4.6 per person, compared to slightly more than 3.5 for cyclists and almost 2.4 for walkers. This shows that the group of runners is the most active online of the three mentioned ones. They are also likelier to follow their tracks and results on mobile apps than two other activities (walkers and bicyclers). The semantic scope of the posts they describe, only in this group, is formulated in the first person singular: 'I' (i.e., 'I run', 'I like running'). It is also worth noting that this group has more men than women. This observation's narcissistic connotations seem apparent, so let us add that it is the photos of runners that individual people dominate, too. Unfortunately, the object detection tool used does not allow for identifying self-portraits and distinguishing them from other users' photos. However, the multi-source analysis of runners' status shows that this is the most individualistic group, practicing its activity alone usually.

Automatic data detection shows interesting patterns in uploaded images and linkages between them. The noticeable disparities between exposure of people ('a person') are #run – 95% and #bicycles – 85%, while in the #walks, the frequency of occurrence of persons is much lower – 62%. It should also be noted the differences between the methods of photo composition for the three analyzed tags: fauna elements ('a bird': 8% for #walks and 3% for #running and #bicycles), infrastructure – the so-called

small urban architecture: 'benches' (6% for #spacery, and 2% for the other two). Supplementing this information with data from the analysis of the tag content, it can be noticed that in the case of #spacery, the analyzed secondary hashtags refer to the season ('autumn', 'autumn vibes', 'autumn vibes'), nature ('leaves', 'forest') or a broader environmental context ('nature', see Tab. 5). Therefore, the 'walks' category indicates more significant interest in the elements of the environment than in the activity itself, which is visible in running and cycling – as shown by the analysis of the content of secondary hashtags.

Discussion

Amateur physical activity is popular and widely trained by young people in our questionnaire-stage sample. Despite the restrictions on staying in public spaces and using various sports facilities, most respondents in the questionnaire declared that they would continue practicing sports. The increase in outdoor activity compensated for the decrease in activity in indoor activity. Training in practicing various sports types and several accompanying behaviors, such as following a special diet, buying specialist equipment, sports clothes, etc., allows one to claim that practicing sports is part of the lifestyle. Thus, the sample's social characteristics in the study indicate that most respondents remained active despite the limitations resulting from COVID-19. This is also evidenced by the study of activity on a social networking site – the photos posted there contain primarily other people. The manner of their description (tags) also includes some references to the social context – groups of sports fans, communities, or social campaigns to promote physical activity.

The above analysis showed that physical activity is an element of social life quite resistant to the limitations of COVID-19 – people do outdoor fitness activities and post their images and comments. The majority of images contain other people. Although usually practiced individually, amateur physical activity fits into a broader social context – an element of an active and healthy lifestyle, the function of belonging to a community, and a part of group identity shaped by relationships with other people. The restrictions resulting from the COVID-19 pandemic were marked by the change in our respondents' regularity of physical activity. However, as illustrated in the questionnaire stage of our research, most respondents adapted their training practices during the COVID-19 quarantine restrictions. The decrease

in indoor training intensity was compensated by an increase in outdoor training activity, especially in three activities: running, cycling, and walking. According to respondents' declarations, these activities are accompanied by electronic mobile devices recording users' various life parameters. The differences between the tags assigned to each of the analyzed types of training are also impressive. The photos described on #walks often contain the landscape, seasonal references, or broadly understood respondents' moods. Documenting one's activity with photographs and making them publicly available on the popular social networking site Instagram follows the pattern known from tourist photographs ('me + a tourist attraction' cliche). In this case, the role of interests is played by a broader social context – the type of activity, other people photographed, and the way of describing the photo. On an individual level, it might be perceived as a 'self-promotion' activity. In contrast, on the social, as the mentioned 'participatory sensing system' (cf. Boy and Uitermark, 2016), with selected representations of particular kinds of activities – how it is experienced socially.

It is also worth noting that there are arguments regarding physical and mental health among the declared motives for practicing sports and physical activity. This may indicate an appropriate level of knowledge about the positive effects of physical activity on a person's general psychophysical self-esteem. The respondents' responses also indicate many motivations related to the social context of the activities performed, such as the possibility of comparing oneself with others belonging to a community. The analysis of photos and use on a social networking site also proves that the motivations of people who engage in physical activity are related to a broader social context. It should be mentioned here that the type of activity adapted to the body's physical fitness, age, and endurance makes it possible to notice that promoting physical activity is not limited only to young people but can also be targeted at other users, i.e., seniors. This is evidenced by analyzing photos and tags of the social network in #walks (#spacery) with reflective aspects of the natural environment. Dogs were detected on more than 5% of images tagged #walks. The potential of social behavior related to motivation for fitness and health is related to the devices used, mobile applications, and detailed declarations and surveys regarding the benefits of using the application perceived by respondents. The diverse motivations declared – a wide range of physical and mental ones-allow to investigate these areas in further research on mobile apps' potential. It is also worth mentioning that in further analysis of tags on running, we can see among the most often used associations

with social campaigns (PL: 'biegam, bo lubię'/ENG 'I run because I like'), which allows you to notice their potential in this area of implementing apps. The analysis of the photograph's content also indicated the social contexts of its cultivation – not only remotely but also in real life, people prefer to meet each other outdoors to be physically active.

The group of cyclists differs in terms of both cycling and the use of mobile technologies. It is required to have a bike, although you should remember about the increasingly popular bike-sharing services where you can rent bikes by the hour. The object detection tool does not distinguish private bikes from those rented in one of the city stations. People are less likely to be found in photos taken by cyclists than in the case of runners and walkers, while more than 1/4 of these photos contain bicycles. The 'bicycle' as a semantic category dominates the descriptions and photographs. This group is also quantitatively dominated by women, as shown by analyzing data from the questionnaire survey.

Walkers are a different group from the two above. They are the least active at the digital level – in the analyzed period, they posted the fewest photos and posts on the Internet. This is the most inclusive category – the questionnaire survey results allow all participants to be included in the survey, and each of them declared this form of activity at least once. Special equipment or clothing is not required here, and the respondents were the least likely to use wearable devices during walks. However, strollers sign their posts and photos differently – although you can find a similar number of people on them as in the images of cyclists. However, the posts are dominated by references to the background, the landscape, or the season. It is undoubtedly related to the pace of movement, which is slower than in the two previous activities. On the other hand, Walkers are the most active – almost 3/4 of the survey participants declared walking 'this week'. On the other hand, slightly more often than in the two different types of activity, walkers declare using a 'special diet', which allows placing this kind of activity in the broader context as an element of the style of living rather than just an episodic activity.

Conclusions: limitation and future work references

In our research, we analyzed amateur physical activity and the impact of COVID-19 on selected physical routines. As wearable devices and mobile apps support amateur and professional users, metadata was also

stored and analyzed. Despite the limited scope and sample selection technique, our study shows some exciting regularities that may be a starting point for in-depth research with an enormous scope. Thanks to methodological triangulation: the combination of traditional questionnaire surveys, enabling the collection of declarative data, and the analysis of data from the social networking site, we investigated the social context of outdoor fitness activity. Despite the selective data from the first stage of the research (survey), similar to Focus Group Interviews in qualitative research in selecting exciting issues, this research shows the potential of choosing research issues or questions. Metric data on respondents and their declaration of involvement in various forms and activity routines allowed us to proceed to the second stage of our research.

In conclusion, our study attempted to describe amateur outdoor physical activity in three selected types: running, cycling, and walking. The applied research method allowed combining the declarative data collected in the online questionnaire available at the turn of October and November 2020 and data collected from the resources of the Instagram social networking site for the same period. Various sources of information and methods of their analysis presented in the article allowed for the description of these groups of users and showed the limitations of such research. We hope that further research will allow for the improvement of description and inference methods, demonstrating the usefulness of triangulation methods in the description of amateur physical activity simultaneously.

Nevertheless, this study has its limitations. Placing an online survey gives potential respondents access to a wide range of information, but the respondents in this research were mainly young, relatively fit, wealthy, and active online. Our research, however, shows that physical activity is an essential part of the activity of young people, and pandemic restrictions and restrictions did not significantly reduce the level of their activity. Somewhat the respondents changed their habits, and an increase in outdoor activities compensated for the decline in various indoor sports. Analyzing one social networking site's photo content and metadata limits its users' sample. Our study showed the following conclusions: practicing amateur outdoor physical activity is a standard part of everyday life. People engage in various activities, especially jogging, cycling, and walking. It is also common to use wearable devices, which are used to take photos and monitor the results but are part of the broader context of new technologies in everyday life.

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STRAVA 2020

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Appendixes

Appendix 1. Metric data about sample in the first, questionnaire stage, of the research (data in %, cumulative response rates at least this year)

		Walks	Bicycles	Run
		87.6	66.4	61.8
Sex	**female**	92.6	65.1	59.1
	male	80.9	68.2	65.5
Age	**15–19 years**	87.7	70.3	65.2
	20–29 years	87.0	58.7	55.4
	30 years and above	90.0	90.0	70.0
Type of residence	**city**	87.8	65.9	60.4
	suburbs	78.8	66.7	69.7
	village	91.8	68.9	62.3
Fitness self esteem	**low**	88.2	56.9	27.5
	moderate	89.0	68.6	67.8
	high	85.4	68.5	73.0
Wealth self esteem	**low**	85.4	68.3	53.7
	moderate	88.1	62.4	61.4
	high	87.7	70.2	64.9
Walks	**rarely at all**	0.0	46.9	56.3
	walkers	100.0	69.2	62.6
Run	**rarely at all**	85.9	57.6	0.0
	runners	88.8	71.9	100.0
Cycling	**rarely at all**	80.5	0.0	51.7
	bikers	91.3	100.0	66.9

Appendix 2. Twenty most frequent pairs of hashtags occurrence
for selected tag: 'run'

	The most common tag pairs	Translation	Frequency of occurrence for the pair
1.	#biegam-#bieganie	#I run-#running	2579
2.	#running-#biegam	#running-#Irun	2452
3.	#biegambolubie-#biegam	#I run because I like-#I run	2349
4.	#run-#biegam	#run-#I run	2333
5.	#run-#running	#run-#running	1900
6.	#running-#bieganie	#running-#running	1836
7.	#run-#bieganie	#run-#running	1732
8.	#biegambolubie-#bieganie	#I run because I like-#running	1728
9.	#running-#biegambolubie	#running-#I run because I like	1634
10.	#run-#biegambolubie	#run-#I run because I like	1560
11.	#runner-#biegam	#runner-#I run	1546
12.	#bieganiejestfajne-#biegam	#running is fine-#I run	1388
13.	#bieg-#biegam	#run-#I run	1386
14.	#biegacz-#biegam	#runner-#I run	1321
15.	#running-#runner	#running-#runner	1292
16.	#run-#runner	#run-#runner	1276
17.	#biegam-#trening	#I run-#training	1242
18.	#runner-#bieganie	#runner-#running	1213
19.	#bieganiejestfajne-#biegam-bolubie	#running is fine-#I run because I like	1190
20.	#bieganiejestfajne-#bieganie	#running is fine-#running	1182

Appendix 3. Twenty most frequent pairs of hashtags occurrence
for selected tag: 'bicycles'

	The most common tag pairs	Translation	Frequency of occurrence for the pair
1.	#rowery-#rower	#bikes-#bike	460
2.	#rowery-#bike	#bikes-#bike	318
3.	#rowerowo-#rowery	#bikely-#bikes	302
4.	#cycling-#rowery	#cycling-#bikes	290
5.	#rowerowo-#rower	#bikely-#bike	224
6.	#rowery-#jesien	#bikes-#autumn	201
7.	#cycling-#rower	#cycling-#bike	198
8.	#rowery-#cyclinglife	#bikes-#cyclinglife	182
9.	#bike-#rower	#bike-#bike	179
10.	#mtb-#rowery	#mountain bike-#bikes	169
11.	#bicycle-#rowery	#bicycle-#bikes	164
12.	#rowery-#rowerowelove	#bikes-#bikes love	155
13.	#rowery-#kolarstwo	#bikes-#cycling	149
14.	#bike-#cycling	#bike-#cycling	148
15.	#cycling-#cyclinglife	#cycling-#cyclinglife	145
16.	#bikelife-#rowery	#bikelife-#bikes	141
17.	#cyclinglife-#rower	#cyclinglife-#bike	137
18.	#rowery-#sport	#bikes-#sport	124
19.	#rowerowelove-#rowerowo	#bike love-#bikely	123
20.	#kolarstwo-#rower	#cycling-#bike	122

Appendix 4. Twenty most frequent pairs of hashtags occurrence
for selected tag: 'walks'

	The most common tag pairs	Translation	Frequency of occurrence for the pair
1.	#spacery-#jesien	#walks-#autumn	685
2.	#autumn-#spacery	#autumn-#spacery	316
3.	#jesien-#autumn	#autumn-#autumn	240
4.	#las-#spacery	#forest-#walks	200
5.	#spacery-#natura	#walks-#nature	179
6.	#spacery-#spacer	#walks-#walk	167
7.	#jesienneklimaty-#spacery	#autumn climates-#walks	152
8.	#spacery-#autumnvibes	#walks-#autumn vibes	146
9.	#spacery-#przyroda	#walks-#nature	145
10.	#spacery-#nature	#walks-#nature	143
11.	#polska-#spacery	#Poland-#walks	141
12.	#liscie-#spacery	#leaves-#walks	128
13.	#spacery-#koloryjesieni	#walks-#autumn colors	128
14.	#natura-#jesien	#nature-#autumn	127
15.	#jesien-#przyroda	#autumn-#nature	121
16.	#jesien-#las	#autumn-#forest	121
17.	#polska-#jesien	#Poland-#autumn	113
18.	#jesien-#jesienneklimaty	#autumn-#autumn climates	109
19.	#jesien2020-#spacery	#autumn 2020-#walks	108
20.	#spacery-#jesiennie	#walks-#autumny	105