Participatory sport events in times of COVID-19: Analysing the (virtual) sport behaviour of event participants

Helsen, Kobe; Derom, Inge; Corthouts, Joris; De Bosscher, Veerle; Willem, Annick; Scheerder, Jeroen

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Participatory Sport Events in Times of COVID-19: Analysing the (Virtual) Sport Behaviour of Event Participants

Research question: Due to government restrictions because of COVID-19, all participatory sport events (PSEs) were cancelled. As a result, knowledge is needed as to how and to what extent participants of PSEs modify their sport behaviour and fill the void of event cancellation. Therefore, this study aims to (1) investigate to what extent event participants have modified their sport behaviour as a result of the COVID-19 measures, and (2) analyse the factors that determine participation in virtual alternatives.

Research methods: A total of 2,869 respondents completed an online survey which was widely disseminated in Flanders (Belgium) six weeks after the announcement of the COVID-19 lockdown. The sample included both event and non-event participants. Correlation and binary logistic regression analyses were used to investigate how event participants adapted their sport behaviour and which factors determined virtual event participation.

Results and findings: Since the COVID-19 measures, event participants did not decrease the frequency but only the intensity of their sport behaviour. Based on social ecological theory, participation in virtual events can be explained by both individual determinants, such as motivation towards developing skills, as well as interpersonal determinants, such as previous participation in a virtual event.

Implications: This study makes a significant contribution to research on the impact of COVID-19 measures on the participants of PSEs. Confronted with an uncertain future, the findings provide insights for event organisers to develop and optimise virtual event experiences in order to reach non-event participants as well.

Keywords: COVID-19; social ecological theory; population survey; cancellation; alternatives

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Introduction

Nowadays, participation in sports has become an important part of many people's lives. Although large cross-national differences exist, more than half of EU28 citizens aged 15 and over are active in sports (Hover et al., 2010; Scheerder et al., 2020). Traditionally, people were active in organised settings, such as sport clubs or health and fitness centres (Nagel et al., 2020). The past decades, the popularity of informal settings (such as informal sport groups or sport events) has increased (Scheerder et al., 2015).

In the current experience economy, participatory sport events (PSEs) are identified as an important leisure time activity (Pine & Gilmore, 2001). The number and popularity of PSEs continues to increase (Scheerder et al., 2015). Research has generated evidence for an understanding of the broader impacts of PSEs (e.g. economic: Coleman & Ramchandani, 2010; and social: Wiltshire et al., 2018), as well as the profiles of their participants (e.g. cycling: Derom et al., 2015; Willem et al., 2017; running: Schoemaker et al., 2020; van Dyck et al., 2017; triathlon: Crofts et al., 2012a; 2012b).

Due to COVID-19, governments in different European countries have imposed national measures (lockdowns) to reduce the pressure on the public health care system. During these lockdowns, most of the activities of sport clubs were prohibited and all PSEs were cancelled. However, in most countries people were still allowed to leave their homes to be active outdoors, but with strict limitations (so-called 'light lockdown').

As a result, it is expected that people will modify their (sport) behaviour differently (based on own motivations, living environment, possibilities to be active, etc.). In addition, PSEs are a gathering of (sometimes large) groups of people who have travelled from different cities and – in some cases – different countries to participate. Consequently, it is unknown when and in what format participation will be possible in the near future as a contagious virus has free rein among participants. To better support event participants in maintaining their sport behaviour and event organisers in offering event alternatives, the purpose of this study is to gain knowledge as to how and to what extent (which types of) participants of PSEs have modified their sport behaviour and fill the gap that remains after PSE cancellations due to the COVID-19 restrictions in the region of Flanders, Belgium. The study, therefore, seeks to answer two research questions: (1) to what extent have event participants modified their sport behaviour as a result of the COVID-19 measures? and (2) what are the determining factors that predict participation in virtual events? Social ecological theory for health promotion provides the theoretical framework for this study (McLeroy et al., 1988) to understand how individuals have adapted their individual sport behaviour in response to major changes in their social and physical environment (e.g., cancellation of PSEs and closure of all sport facilities, among others). This study makes an important contribution to the literature by investigating the impact of COVID-19 on (different types of) participants of PSEs. In addition, no study has identified the segments that respond to new (virtual) sport initiatives (Mutz & Gerke, 2020).

Literature

Participatory sport events (PSEs) are “open-entry events” (Crofts et al., 2012b, p. 149) with a particular focus on “promoting participation and engagement rather than the significance of the sporting outcome” (Coleman & Ramchandani, 2010, p. 25). Although both elite and non-elite participants can partake in PSEs, the majority of participants in PSEs are non-elite. Opposite to the PSEs are the spectator sport events which are tied to an ongoing competition and reserved for elite athletes. Examples include Olympic Games and World Championships Football (Mega Sport Events; MSEs), or European and national championships of athletics (Non-Mega Sport Events; NMSEs) (Gratton & Taylor, 2000; Taks, 2013).

PSEs come in different shapes and sizes (e.g. marathons and half marathons, on- and off-road cycling events, walking and triathlon events attracting less than 100 to more than 10,000 participants). These events have the potential to make a positive health impact, as evidence shows that participants increase their sport and physical activity behaviour during event preparation and consequently, some remain sufficiently active in the post-event period (Crofts et al., 2012a; 2012b; Derom et al., 2015; Lane et al., 2010; Schoemaker et al., 2020). Intrinsic motivation (e.g. health, skill and social affiliation) has been found to positively contribute to participants' perception of their event achievement, which in turn positively influences their autonomous motivation to remain active in the post-event period (Coleman & Sebire, 2017). Furthermore, post-event commitment to sports and physical activity has been stronger among those who were more satisfied with their event experience and had completed fewer prior organised events, at least in the short term (Funk et al., 2011; Willem et al., 2017).

Recently, studies have considered the impact of COVID-19 lockdown measures on changes in sport and physical activity behaviour, using the COVID-19 period as a reference point for conducting pre and post analyses. Most notably, sport and physical activity behaviours have declined sharply and significantly among the general population during COVID-19 (e.g., Mutz & Gerke, 2020; Schnitzer et al. 2020). In Germany, almost 60% of the surveyed population was inactive during COVID-19, citing the lockdown of sport facilities as the most impactful factor, and reductions in sport and physical activity behaviour were more common among older age groups (Mutz & Gerke, 2020). Seniors have been affected tremendously given their higher risk of COVID-19 and their decreased attendance at organised physical activity programs (Goethals et al., 2020; Scheerder et al., 2020). In addition, school-aged children have also decreased their time spent on sport and physical activity because of COVID-19 (Pietrobelli et al., 2020). In Tyrol, Austria, a province with relatively high levels of sport participation among the general population, the levels of physical inactivity during COVID-19 were lower when compared to Germany, situated around 40% (Schnitzer et al., 2020). Remarkably, 22% of the surveyed population in Tyrol was in favour of promoting mass PSEs to support their post COVID-19 activities (Schnitzer et al., 2020). The cancellation of PSEs was also identified as a significant barrier to sport and physical activity participation among 32% of survey respondents in Belgium who were highly active in the pre-COVID-19 period (Constandt et al., 2020).

During COVID-19, some event organisers were able to offer an alternative and transferred their events to an online or virtual environment to support individuals' training efforts. When participating in an online or virtual event, people participate in a real sporting activity, they record their activities using a software on their smartphone or wearable, and they submit their results to the event organiser via an online platform (Wattanapisit et al., 2020). To date, no study has investigated the impact of COVID-19 on the sport and physical activity behaviour among participants of PSEs. Although online and virtual events were launched during COVID-19, Mutz and Gerke (2020) noted that no study has identified what segments responded to these new initiatives. Therefore, the results of this research can support event organisers in further developing and optimising their sport service products in an online or virtual environment by gaining knowledge of the (virtual) sport behaviour of event participants. Crisis situations may occur more often in the future after all (Mitschang, 2012).

Theoretical Framework

The properties of social ecological theory illustrate that an individual's behaviour (including one's sport behaviour) is influenced by the multiple environments that surround the individual (McLeroy et al., 1988, borrowing from the work of Belsky, 1980;

Bronfenbrenner, 1979; Eng et al., 1985). Besides different intrapersonal (or individual) factors (such as demographics and attitudes), these surrounding environments cover the interpersonal (peers and family), the institutional (school, work and local organisations), the community (available infrastructure) and the political environment (policies), each having a distinct influence on the individual (McLeroy et al., 1988). As an example, previous research conducted in the close environment of individuals reported the positive influence of parents' behaviour as active sport participants on the behaviour of their children (Moore et al., 1991; Zecevic et al., 2010). In the more distant environment, (local) sport policies (Hoekman et al., 2017; Nicholson et al., 2011) as well as culture (Van Tuyckom, 2011) can account for differences in sport behaviour.

Social ecological theory has been applied in research concerning PSEs in particular because these events can be conceptualised as a health promotion intervention (e.g. Derom et al., 2015; Van Dyck et al., 2017). To date, the influence of individual and interpersonal factors of participation in cycling (Derom et al., 2015), running (Van Dyck et al., 2017) and triathlon (Crofts et al., 2012a; 2012b) events has been investigated. However, research has not yet considered the influence of institutional, community or political factors on event participation, nor the impact of the cancellation of sport events, located at the institutional level of the social ecological model, on the individual sport behaviour of any kind of event participants. As the influence of these higher levels were largely the same for many individuals (being remote working or not working at all, closures of all infrastructures, and the same measures imposed by the government for the whole population) and considering the length of the online survey, this study is focusses on, the individual and interpersonal environments. Therefore, this study will fill the gap in literature by analysing to what extent (running, cycling, walking and/or triathlon) event participants have modified their sport behaviour and which individual and/or interpersonal variables determine participation in newly offered virtual events, after a cancellation of all physical sport events.

Material and Methods

Context and Procedure

The current study used a quantitative approach, more specifically an online population survey. A quantitative is used over a qualitative approach, as it allows to collect data for many, and a diversified group of, individuals in a short period of time. This allowed identifying profiles, behaviour and motivations of those that do and do not participate in virtual events. In addition, the objective was to reach different types of event participants rather than participants of a specific sport event, as focusing on a specific (type of) sport event could influence the results. Furthermore, the quantitative survey allowed, to target both event and non-event participants, which is necessary to look at current and potential event participants. Finally, a measurement during this short period was needed as measures taken by the government could change rapidly, denoting another impact on event participants. Further, newly developed (virtual) event initiatives could influence results as well. By stretching the reference period, the chances are greater that these initiatives emerge.

Exactly six weeks after the announcement of the Belgian lockdown, the standardised online questionnaire was widely disseminated among the Flemish population (see *[author(s)]*). The questionnaire was available between 24 April and 4 May 2020 and distributed through multiple channels: (i) the most popular newspaper in Flanders in terms of number of readers (Het Laatste Nieuws; an announcement on 24 April – both online and in print – and an online reminder on 28 April); (ii) Dutch-speaking sport federations, commercial sport (event) providers and (local) sport governing bodies (both online and through their e-mail channels); and (iii) academic and personal networks of the authors. Responses were recorded using the Qualtrics software.

Instrument

Dependent Variables

The modification of sport behaviour as a result of the COVID-19 measures (RQ1) was measured via two closed-ended questions: 'In the period before the measures I participated in sports/active forms of exercise' and 'In the period since the measures I (still) participate in sports/active forms of exercise'. Four answering categories were offered (no/ yes, less than once a week/ yes, once a week/ yes, more than once a week; Borgers et al., 2016; Lievens et al., 2014).

Whether or not the respondent participated in virtual events (RQ2) was measured via one closed-ended question: 'Did you participate in a virtual event to replace the postponement/cancellation of the event'. Hereby, two answering categories were offered (yes/ no).

Independent Variables

In accordance with the theoretical framework, variables at the individual and interpersonal environment are included (McLeroy et al., 1988). The relevant *individual variables* were: (i) socio-demographic characteristics, such as sex (male/ female/ other), age (birth year), highest level of education achieved (primary or secondary education/ higher education/ still studying), being a parent of inhouse children (yes/ no), having an impairment or chronic disease (yes/ no), and the ease of living comfortable with the family income (subjective income measured on a seven-point Likert scale ranging from 'difficult to make ends meet' to 'I can live very comfortably'); (ii) motivation to participate in the event, measured using the abbreviated version of the Recreational Experience Preference (REP) scale consisting of 32 items and seven factors (abbreviated version was validated by Alexandris et al. (2009) among winter sport tourists; the scale was originally developed by Driver (1977; 1983) and found reliable and valid by Manfredo et al. (1996); the abbreviated version of the REP scale is measured on a five-point Likert scale ranging from strongly disagree to strongly agree); (iii) involvement in sports, measured by a leisure involvement scale consisting of twelve items and three factors including attraction, centrality and self-expression (the scale was developed by Laurent & Kapferer (1985) and Zaichkowsky (1985), and further elaborated and validated by Kyle et al. (2004) among hikers, boaters and anglers; the leisure involvement scale is measured for the most important sport they practiced in an event context, being running, walking, cycling, or triathlon, on a five-point Likert scale ranging from totally disagree to totally agree).

The relevant *interpersonal variables* were divided in relevant influencing factors before the measures on the one hand, and influencing factors since the measures on the other: (i) the frequency of general sport and exercise behaviour before the COVID-19 measures (not active/ less than once a week/ once a week/ more than once a week; Borgers et al., 2016; Lievens et al., 2014); (ii) the characteristics of sport and exercise behaviour of the sport with which they felt most involved before the COVID-19 measures (which sport; experience in number of years; and intensity per day: less than half an hour/ 30 to 60 or 90 minutes/ more than 60 or 90 minutes. The classification of 60 or 90 minutes was chosen arbitrarily by the authors to distinguish the intensity based on each sport's characteristics. For running, swimming and dance: 60 minutes. For cycling, yoga and fitness, walking, team sports, batting sports and martial arts: 90 minutes; Borgers et al., 2016; Lievens et al., 2014); (iii) participation of the sport with which they feel most involved: in a club, with a partner, with family (other than partner), or with friends (yes/ no) (Borgers et al., 2016; Lievens et al., 2014); (iv) prior participation in virtual sport events (yes/ no); (v) prior event experience (number of PSEs in which the respondent participated twelve months before the COVID-19 measures, four groups are composed based on frequency analyses and dividing in three equal groups without taking into account the participants that had not participated in any event: 0 events, 1-4 events, 5-12 events and 13 events or more; Alexandris et al., 2019).

In addition, the relevant influencing *interpersonal variables* since the measures were: (i) the frequency of general sport and exercise behaviour since the COVID-19 measures (not active/ less than once a week/ once a week/ more than once a week (Borgers et al., 2016; Lievens et al., 2014); (ii) aspects of event participation they will miss most if their event is (to be) cancelled: the feeling of competition; being active with others; drinking something together after sport (closed-ended question measured on a five-point Likert scale ranging from strongly disagree to strongly agree; Constandt et al., 2020); (iii) the modification of training intensity because of the COVID-19 measures as preparation for the sport event for which they were training: 'Because of the COVID-19 measures, I modified my training intensity in preparation for the event' (closed-ended question with three answering possibilities: no, I train at the same intensity/ yes, I train at a lower intensity/ yes, I train at a higher intensity).

Participants

In total, 2,869 respondents (partially) completed the questionnaire. After checking for age (18 to 75 years) and a minimum completion of at least 50% for the survey, 2,290 respondents were maintained for further analyses (*[author(s)]*). Participants were further classified as event participant (n = 1,921) or non-event participants (n = 288) to be able to analyse distinctive features of current and potential event participants respectively. The *event participant* participated in at least one sport event (in running, walking, cycling or triathlon) in the twelve months prior to the COVID-19 measures and/or was training for at least one sport event (in running, walking, cycling or triathlon) before the COVID-19 measures were taken. The *non-event participant* did not participate in or was not training for a sport event (in running, walking, cycling or triathlon) before the COVID-19 measures were taken (see also *[author(s)]*).

The rationale to focus on events of these four sports is based on two reasons. First, PSEs typically focus on one of these four sports (e.g. Kenelly, 2017) and there are very few PSEs of other sports that are open-entry and not tied to an ongoing competition (Crofts et al., 2012b). Second, cycling, running and walking are the three most popular sports in Flanders (with swimming on the fifth place; Thibaut et al., 2019).

Data Analyses

Confirmatory factor analysis (CFA) was used for the abbreviated version of the REP motivation scale and the leisure involvement scale using AMOS 26.0 (Alexandris et al., 2009; Kyle et al., 2004). First, the CFA revealed two additional factors within the existing ones (the excitement/risk factor becoming one excitement and one risk factor, as well as the socialisation factor becoming one internal socialisation and one external socialisation factor). In addition, two items were deleted because of low factor loadings. These findings are in accordance with the original (extended) REP scale (Manfredo et al., 1996). The global fit indices confirm the goodness of fit of the model (CFI = 0.932, TLI = 0.914, RMSEA = 0.038; Hu & Bentler, 1999). Therefore, nine factors consisting of 30 items are used for further analyses (Table 1). Second, based on the CFA two items were deleted for the involvement scales. The model has a good fit (CFI = 0.974, TLI = 0.955, RMSEA = 0.057; Hu & Bentler, 1999). Three factors consisting of ten items are used for further analyses (Table 1).

To examine the (modification of) sport behaviour of event participants, descriptive analyses (including percentages, chi-square tests and Spearman's correlation analyses) are executed. Further, binary logistic regression analyses are used to explore determining factors of virtual event participation since the implementation of the COVID-19 measures by using SPSS 27. There was no multicollinearity among the items with VIF values below 2.092 (Hair et al., 2013).

[Insert Table 1 near here]

Results

Profile of Event and non Event Participants

Table 2 presents the demographics of respondents for (i) the total sample, (ii) respondents with an endurance sport as main activity (i.e. cycling, running or walking; henceforth: *endurance participants*), and (iii) respondents with a non-endurance sport as main activity (i.e. yoga/fitness, swimming, dancing, team sports, batting sports, martial arts or other sports; henceforth: *non-endurance participants*)[1]. Results show that event participants are more often engaged in endurance sports compared to non-event participants after all (82.4% vs. 36.5%). Hereafter, an endurance event participant,

[1] The distinction between endurance participants and non-endurance participants enables differentiation between event participants who have a main sport activity that can be practiced at PSEs (e.g. runner who can participate in organised running events) and those who do not (e.g. hockey player who can participate in organised cycling events).

endurance non-event participant, non-endurance event participant and non-endurance non-event participant will be abbreviated by EEP, ENP, NEP and NNP respectively.

Event participants are predominantly male, both in the total sample (66.3% vs. 55.4%) and among endurance participants (EEP: 67.8% vs. ENP: 53.0%). Further, half of the event participants is between 35 and 54 years old, whereas only 30.9 percent of non-event participants is in this age group. In addition, more event participants are frequently active (i.e. exercise more than 1 time/week), are active in cycling and/or running, have participated in virtual events before the measures, and are interested to participate in virtual since the measures compared to non-event participants.

[Insert Table 2 near here]

Modification of Sport Behaviour

Individuals were as frequently (non-)active prior to and following the implementation of COVID-19 measures, based on spearman correlation between the frequency of general sport participation before and since COVID-19 measures (r_s=.28; p<.001; Table 3). Despite a cancellation of all sport events, event participants maintained their frequency in general sport participation (r_s=.25; p<.001). Results show more stable exercise patterns among NEP (r_s=.32; p<.001) compared to EEP (r_s=.22; p<.001). Those who practice an endurance sport have more stable exercise patterns (r_s=.24; p<.001) compared to non-endurance participants (r_s=.18; p<.001).

[Insert Table 3 near here]

In the remainder of this study, the focus will be on event participants (i.e. EEP and NEP) because non-event participants were not training for an event that was cancelled due to COVID-19 (see definition of event participants in the paragraph *Participants*), and thus are not able to modify the training intensity in preparation for a sport event or are not able to participate in a virtual event to replace the cancellation of the event. Although event participants maintained the frequency of general sport participation, results show that almost half of the participants who were training for a sport event decreased the intensity of training (47.4%) because of the COVID-19 measures. About one third maintained their training intensity (35.5%) and 17.2 percent increased their training intensity in preparation for the event. More endurance participants kept training at the same intensity, compared to non-endurance participants (Table 4).

[Insert Table 4 near here]

Participation in Virtual Sport Events

Table 5 shows the binary logistic regression analyses of event participants partaking in virtual events (as an alternative to cancelled traditional sport events). Building on the properties of social ecological theory, four models are used in which determining factors of the individual, interpersonal (before measures), interpersonal (since measures) system and type of event are added sequentially. In the first model, seven percent of the variance is explained by the variables of the individual system. The model has a good fit (χ^2 (20) = 59.971; p<0.001). After adding ten variables that relate to the interpersonal environment (sport behaviour before COVID-19 measures), the model has a stronger fit (χ^2 (32) = 172.374; p<0.001), with an additional 12.2 percent of the variance in the model being explained by the variables. After adding five more variable of the interpersonal environment (sport behaviour since COVID-19 measures), the variance explained by the model increased with 3.1 percent (χ^2 (38) = 202.804; $p<0.001$). In the fourth model the type of sport event is added, explaining an additional 1.2 percent of the variance (Nagelkerke R^2 = 0.235; χ^2 (41) = 214.890; $p<0.001$).

Important individual determining variables to predict participation in virtual sport events are being motivated to participate in PSEs because of risk and skill development. For every unit increase of being motivated by risk and skill development, the odds of participating in virtual events changes with 1.241 and 1.386 respectively (increasing). Furthermore, results show a negative influence being motivated by internal socialisation. For every unit increase of being motivated by internal socialisation, the odds of participating in virtual events changes with 0.844 (decreasing). Socio-demographic variable are not found to be significant predictors of virtual event participation.

When considering the variables of the interpersonal environment, results show that less frequent event participants (i.e. participating in one to four sport events in the twelve months prior to the COVID-19 measures), are less likely to participate in virtual events compared to frequent event participants (i.e. participation in thirteen sport events or more). Further, the event participants that were quite intensive before the measures and experienced are less likely to participate in virtual events as well. Participation in virtual events before the COVID-19 measures, as well as the frequency and intensity of sport participation since the COVID-19 measures, seem to be strong and significant predictors for virtual event participation after the measures.

When looking at the type of PSE (model 4), results show that people training for a walking or triathlon event were less likely to participate in virtual events, compared to those training for a running event. Further, Table 6 presents four regression analyses which only include the significant variables of Table 5 to study determining factors of virtual event participation according to the four different sports (the frequency of sport participation since the measures was left out of the analyses, because of a low number of cases). Results show a larger explained variance for the variables of the interpersonal environment compared to the individual variables for each sport. Being motivated by risk is an important predictor for virtual event participation among running event participants, whereas skill development seems to be a strong predictor among cycling event participants. Among running event participants, the intensity of sport participation before measures is a negative predictor, whereas the modification of intensity of sport participation after the measures is a positive predictor for virtual event participation. For all four sports, participation in virtual events before the measures is a strong and positive predictor of virtual event participation.

[Insert Table 5 near here]

[Insert Table 6 near here]

Discussion

Recent research showed the negative impact of COVID-19 on physical activity among the general population and school-aged children and elderly in particular (Goethals et al., 2020; Mutz & Gerke, 2020; Pietrobelli et al., 2020; Schnitzer et al. 2020). This research, however, shows stable exercise patterns among participants of PSEs in Flanders since the lockdown, showing no evidence of a decline in their frequency of sport participation. It should be noted that this applies to highly active event participants in a particular sport, who, based on the findings in this paper, can overcome obstacles in their environment (i.e. cancellation of sport events, closure of sport facilities and sport clubs) to maintain their sport behaviour. Therefore, PSEs are not indispensable for highly active sport event participants, at least in the short term during the first six weeks after the announcement of the COVID-19 measures, to remain active. Nonetheless, as past research demonstrated the usefulness of PSEs for exercise (Crofts et al., 2012a; 2012b; Derom et al., 2015; Lane et al., 2010; Schoemaker et al., 2020), they could be important and essential for other segments (e.g. the sporadic event participant). In addition, this research cannot speak of the importance of these sport events in the long term, as the study took place six weeks after the start of the first lockdown. Different results can potentially be assumed if the study would be repeated during the current second lockdown?

Although event participants maintained the frequency of general sport participation, results show that almost half of the participants who were training for a PSE decreased the intensity of training because of the COVID-19 measures (RQ1). In all of this, endurance participants showed a more stable exercise pattern compared to non-endurance participants. This can be clarified by lower club membership numbers among endurance participants (46%) compared to non-endurance participants (70%), and the importance of participation in sport clubs for club members (Borgers et al., 2016; Nagel et al., 2020).

Results show that nine percent of event participants participated in virtual events before and 23 percent gained interest in virtual events since the COVID-19 measures. Moreover, 30 percent of event participants did participate in a virtual sport event after the cancellation of their physical sport event. Some organisers found creative, innovative and virtual ways to reach sport consumers during the lockdown. Considering the fact that not every individual has the know-how or financial capabilities (in terms of buying a wearable to track training sessions) to participate in such virtual events, it is expected that different segments of sport consumers are reached (Czaja et al., 2006; Urbanova et al., 2019). In the context of this research, social ecological theory is used to investigate determining factors of virtual event participation. In the past, this theoretical framework has proved its use by emphasising the influence of different environments on sport behaviour among sport (Hoekman et al., 2017) and PSE participants (Derom et al., 2015; Van Dyck et al., 2017).

This research indicates that the interpersonal environment (more specifically the sport behaviour before the COVID-19 measures) is the strongest predictor of virtual event participation (explaining 12.2% of the explanatory variance; Table 5). As in other research on real-life PSEs, this study showed no significant influence of socio-demographic variables on virtual event participation (e.g. Derom et al., 2015; van Dyck et al., 2017). In addition, event participants who are motivated by aspects of risk (especially among running event participants) and skill development (especially among cycling event participants) are more likely to participate in virtual alternatives. Conversely, event participants who participate in events for social reasons are less likely to participate in virtual sport events. This is not remarkably, as the social aspect was mainly absent when the first virtual events were launched (e.g. Wattanapist et al., 2020). Lastly, prior virtual experience is a strong predictor and event participants taking part in running events are more likely to participate in virtual events as well. The latter was expected, as the organisation of this sport in a virtual format is more common and feasible (Wattanapist et al., 2020).

Theoretical and practical implications

This study yields two important theoretical contributions to the literature. First, this study fills the gap in literature on social ecological theory by extending past research with other sports, as walking and triathlon participants have not yet been studied in the context of this theoretical framework. Second, the individual and interpersonal environment has been deliberately studied among participants of physical sport events (e.g. Crofts, 2012a; 2012b; Derom et al., 2015; Van Dyck et al., 2017), but not yet for participants of virtual sport events (Mutz & Gerke, 2020). This study shows that virtual event participation is also mainly influenced by the sport behavior before the COVID-19 measures (interpersonal environment), and not by socio demographic variables (Derom et al., 2015; Van Dyck et al., 2017).

The presented results comprise some practical implications to support event organisers in developing and optimising their (virtual) services for the future. First, virtual event participants are predominantly driven by risk and skill development. Event organisers need to ensure that virtual events contain a risk element and cover a challenge. In particular for those events that require participants to run a certain distance in their own environment, alone with a wearable, as this can get monotonous and less challenging for participants in the long run. This virtual format does not include a social component and this study shows that this component is currently missing in virtual events, as people who are motivated to be active because of social reasons are less likely to participate in virtual events. It needs to be stressed that the data for this study were collected six weeks after the announcement of the first lockdown. At the time being, virtual events were not yet very developed and attractive. Nowadays, different formats exist, such as virtual rankings of several challenges or apps which include a social component (e.g. the MyTrace App where a speaker encourages you while you run with additional information on the surroundings and live leaderboards). Second, a first virtual experience is a strong predictor for virtual participation since the COVID-19 measures. Therefore, it is important for organisers to offer low threshold first virtual experiences to improve the odds of a sustainable virtual participation.

Questions arise on the future of PSEs. Physical events are characterised by a high number of contacts, and thus spreading of possible viruses. Virtual events on the other hand are safe (in terms of spreading viruses), but often lack a social or entertainment component. Currently, scholars argue that virtual sport events might complement traditional sport in the future (Westmattelmann et al., 2020). Research indicated the importance of physical PSEs for sport participation and thus those events are expected to flourish as soon as they are allowed again (Constandt et al., 2020; Schnitzer et al., 2020). On the other hand, virtual events attract an additional group of customers (e.g. people who do not have the time to travel around the world to complete the World Marathon Majors, but are willing to run it from home, or people who are occupied on the day of the event and therefore complete the marked course the week before the actual event). These new segments might be interesting for event organisers.

Limitations and future research

The current study yields some limitations. First, based on the questionnaire, it was possible to define PSE participants in different ways (i.e. event participation in the respondent's main activity on the one hand, or event participation in running, cycling, walking and/or triathlon events on the other). This study used the latter type of defining event participants to make the group as uniform as possible, which resulted in a quite broad group and definition of event participants (including the competitive runner who strives for personal records on marathons as well as the less active individual who participated in one walking event). However, as event participants are at the same time a very specific and broad group, the authors are convinced that the latter is the best way to define them. Second, self-selection bias and socially desirable answers are a structural part of the online data collection method. This may have caused that mainly those who were interested in the research completed the questionnaire. However, in times of crisis people are less accessible because they need to stay indoors. In such circumstances, an online data collection with broad dissemination provides a good solution to reach individuals.

Future studies could extend the literature on PSEs by studying the influence of individual and interpersonal determining factors among physical walking and triathlon events as well. Further, the influence of other systems (such as institutional, community and political) on virtual sport event behaviour can be studied, as soon as the COVID-19 measures are loosened.

Conclusion

This paper fills the gap in literature on the impact of the COVID-19 measures on participants of PSEs. The insights are needed, as no study has yet identified the segments that respond to these new initiatives and as crisis situations may occur more often in the future (Mitschang, 2012; Mutz & Gerke, 2020). By acting quickly, the authors were able to respond to current issues in society. Whereas other research focused on the impact on sport participation among the population in general (e.g. Constandt et al., 2020; Mutz & Gerke, 2020; Schnitzer et al. 2020), this study can be seen as an in-depth study on a particular segment.

Compared to the overall population, the cancellation of PSEs is not seen as an exercise obstacle for highly active event participants when considering the frequency of sport participation (Constandt et al., 2020). Furthermore, this study reveals the main segments that are reached with virtual sport events. Results point out that socio demographic characteristics are no significant predictors and that prior virtual experience, and a higher frequency and intensity of sport participation since the measures facilitated the step to virtual events during the COVID-19 crisis.

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List of Tables

Table 1. Results of confirmatory factor analyses for the Recreational Experience Preference (REP) scale and leisure involvement scale

	Items	AVE	CR
Recreational Experience Preference scale			
Escape	6	0.38	0.78
1. To rest			
2. To help release or reduce some built up tensions			
3. To relax			
4. To release or reduce tension			
5. To have a change from your daily routine			
6. To get away from crowded situations from a while			
Social recognition	4	0.66	0.89
9. To be recognized for doing it			
10. To show others I can do it			
11. To do something that impresses others			
12. To be seen by others doing it			
Enjoying nature	3	0.70	0.88
13. To enjoy nature			
14. To be close to the nature			
15. To view the scenery			
Risk	3	0.63	0.83
16. To experience the risks involved			
17. To chance dangerous situations			
18. To take risks			
Excitement	2	0.45	0.62
19. To experience excitement			
20. To experience a lot of action			
Internal socialisation	2	0.72	0.84
21. To do things with my friends/family			
23. To be with my friends/family			
External socialisation	3	0.57	0.79
22. To meet new people			
24. To see new faces			
25. To observe other people in the area			
Skill development	4	0.31	0.64
26. To develop my skills and abilities			
27. To see if I could do it			
28. To become better at it			
29. To be challenged			
Achievement	3	0.50	0.75
30. To increase my feelings of self-worth			
31. To develop a sense of self-pride			
32. To improve my self-esteem			
Leisure involvement scale			
Attraction	4	0.62	0.87
1. … is important to me			
2. Participating in … is one of the most enjoyable things that I do			
3. Participating in … is one of the most satisfying things that I do			
4. I have little or no interest in …			
Centrality	3	0.56	0.79
6. I find a lot of my life is organized around …			
7. I enjoy discussing … with my friends			
8. Most of my friends are in some way connected with …			
Self-expression	3	0.52	0.76
10. You can tell a lot about a person be seeing them …			

11. When I participate in … others see me the way I want them to see me			
12. … says a lot about who I am			

Table 2. Description of respondents with a (non-)endurance sport as main activity, in percentages (1/2)

Variable	Total sample			Endurance participant			Non-endurance participant		
	Total (n = 2,209)	Event participant (n = 1,921)	Non-event participant (n = 288)	Total (n = 1,688)	Event participant (n = 1,583)	Non-event participant (n = 105)	Total (n = 521)	Event participant (n = 338)	Non-event participant (n = 183)
Sex	*χ^2=12.366****			*χ^2=9.299***			*χ^2=0.253*		
Male	64.8	66.3^a	55.4^b	66.9	67.8^a	53.0^b	58.2	59.1^a	56.7^a
Female	35.2	33.7^a	44.6^b	33.1	32.2^a	47.0^b	41.8	40.9^a	43.3^a
Age	*χ^2=36.538****			*χ^2=18.033****			*χ^2=0.685*		
18-34 years	35.1	32.9^a	48.9^b	26.6	26.8^a	24.0^a	62.5	62.0^a	63.4^a
35-54 years	47.4	50.0^a	30.9^b	53.6	54.5^a	40.0^b	27.5	28.6^a	25.6^a
55-74 years	17.5	17.1^a	20.2^a	19.8	18.7^a	36.0^b	10.0	9.4^a	11.0^a
Education	*χ^2=15.467****			*χ^2=0.327*			*χ^2=0.422*		
Still studying	6.7	5.8^a	12.1^b	3.9	3.9^a	5.0^a	15.6	15.3^a	16.3^a
Primary/ secondary education	21.3	21.8^a	18.4^a	23.4	23.5^a	23.0^a	14.6	14.0^a	15.7^a
Higher education	72.0	72.3^a	69.5^a	72.6	72.7^a	72.0^a	69.8	70.8^a	68.0^a
Children living at home	*χ^2=24.689****			*χ^2=2.919*			*χ^2=1.364*		
Yes	46.0	48.1^a	32.0^b	51.3	51.8^a	43.0^a	28.8	30.6^a	25.6^a
No	54.0	51.9^a	68.0^b	48.7	48.2^a	57.0^a	71.2	69.4^a	74.4^a
Disability[1]	*χ^2=9.361***			*χ^2=10.592***			*χ^2=1.538*		
Yes	10.6	9.7^a	15.9^b	10.4	9.7^a	20.0^b	11.1	9.7^a	13.5^a
No	89.4	90.3^a	84.1^b	89.6	90.3^a	80.0^b	88.9	90.3^a	86.5^a
Income	*χ^2=3.815*			*χ^2=6.147*			*χ^2=3.345*		
(very/rather) difficult to make ends meet	13.9	13.5^a	16.2^a	13.7	13.2^a	21.0^a	14.6	15.3^a	13.4^a
Rather easy to make ends meet	27.8	28.4^a	23.5^a	27.5	27.9^a	21.0^a	28.8	30.9^a	25.0^a
Easy to make ends meet	33.9	33.6^a	36.4^a	34.5	34.4^a	36.0^a	32.2	29.6^a	36.6^a
Very easy to make ends meet	24.4	24.5^a	23.9^a	24.4	24.5^a	22.0^a	24.4	24.1^a	25.0^a
Type sport[2]	*χ^2=293.368****			*χ^2=N/A*			*χ^2=N/A*		
Endurance participant	76.4	82.4^a	36.5^b	100.0	100.0	100.0	0.0	0.0	0.0
Non-endurance participant	23.6	17.6^a	63.5^b	0.0	0.0	0.0	100.0	100.0	100.0
Frequency sport	*χ^2=85.649****			*χ^2=101.681****			*χ^2=7.338***		
1 time/week or less	9.2	7.0^a	24.0^b	8.2	6.4^a	34.3^b	12.7	9.8^a	18.0^b
More than 1 time/week	90.8	93.0^a	76.0^b	91.8	93.6^a	65.7^b	87.3	90.2^a	82.0^b

Table 2. Description of respondents with a (non-)endurance sport as main activity, in percentages (2/2)

Variable	Total sample			Endurance participant			Non-endurance participant		
	Total (n = 2,209)	Event participant (n = 1,921)	Non-event participant (n = 288)	Total (n = 1,688)	Event participant (n = 1,583)	Non-event participant (n = 105)	Total (n = 521)	Event participant (n = 338)	Non-event participant (n = 183)
Club membership	*χ^2=1.301* 51.7	52.2^{a}	48.6^{a}	*χ^2=40.589**** 46.2	48.2^{a}	16.2^{b}	*χ^2=0.808* 69.7	71.0^{a}	67.2^{a}
Cycling	*χ^2=48.853**** 57.9	60.7^{a}	38.9^{b}	*χ^2=4.521** 63.0	63.7^{a}	53.3^{b}	*χ^2=12.785**** 41.1	46.7^{a}	30.6^{b}
Running	*χ^2=239.926**** 73.4	79.0^{a}	35.8^{b}	*χ^2=97.942**** 79.0	81.6^{a}	41.0^{b}	*χ^2=56.694**** 55.1	67.2^{a}	32.8^{b}
Yoga/fitness	*χ^2=2.872* 23.8	23.2^{a}	27.8^{a}	*χ^2=1.565* 20.0	20.3^{a}	15.2^{a}	*χ^2=0.207* 36.3	37.0^{a}	35.0^{a}
Walking	*χ^2=4.156** 35.9	35.1^{a}	41.3^{b}	*χ^2=26.126**** 37.6	36.0^{a}	61.0^{b}	*χ^2=0.057* 30.7	31.1^{a}	30.1^{a}
Swimming	*χ^2=12.094*** 25.7	27.0^{a}	17.4^{b}	*χ^2=10.376*** 24.5	25.4^{a}	11.4^{a}	*χ^2=10.476*** 29.6	34.3^{a}	20.8^{a}
Dancing	*χ^2=34.378**** 3.7	2.8^{a}	9.7^{b}	*χ^2=0.282* 2.1	2.1^{a}	2.9^{a}	*χ^2=9.022*** 8.6	5.9^{a}	13.7^{b}
Team sports[3]	*χ^2=28.759**** 12.2	10.8^{a}	21.9^{b}	*χ^2=1.159* 5.1	5.2^{a}	2.9^{a}	*χ^2=0.790* 35.3	36.7^{a}	32.8^{a}
Batting sports[4]	*χ^2=10.280*** 7.0	6.3^{a}	11.5^{b}	*χ^2=0.044* 4.2	4.2^{a}	3.8^{a}	*χ^2=0.001* 15.9	16.0^{a}	15.8^{a}
Martial arts[5]	*χ^2=12.119**** 1.9	1.5^{a}	4.5^{b}	*χ^2=0.092* 0.7	0.1^{a}	1.0^{a}	*χ^2=0.332* 5.8	5.3^{a}	6.6^{a}
Participation in virtual events before measures	*χ^2=17.373**** 7.9	8.8^{a}	1.7^{b}	*χ^2=6.506** 10.1	10.6^{a}	2.9^{b}	*χ^2=0.391* 0.8	0.6^{a}	1.1^{a}
Interested to participate in virtual events since measures	*χ^2=16.290**** 21.8	23.2^{a}	12.4^{b}	*χ^2=8.017*** 22.4	23.2^{a}	11.0^{b}	*χ^2=7.162*** 19.7	23.3^{a}	13.2^{b}
Participation in virtual event after cancellation event	*χ^2=N/A* 29.6	29.6	0.0	*χ^2=N/A* 30.5	30.5	30.5	*χ^2=N/A* 22.8	22.8	22.8

Note. ***$p<.001$; **$p<.01$; *$p<.05$; [a, b] differ significantly; N/A = not available; [1] disability defined as having a chronical disease, physical and/or mental disability; [2] Endurance sports are running, cycling and walking, non-endurance sports are yoga/fitness, swimming, dancing, team sports, batting sports or martial arts; [3] Team sports include football, volleyball, basketball, etc.; [4] Batting sports include sports that are practiced with a bat and against a team that consists of one or maximum two individuals, such as tennis, badminton, table tennis, etc.; [5] Martial arts include judo, boxing, karate, etc.

Table 3. Spearman correlation between frequency of general sport participation before and since COVID-19 measures

	Total sample			Endurance participant			Non-endurance participant		
	Total	Event participant	Non-event participant	Total	Event participant	Non-event participant	Total	Event participant	Non-event participant
N	2,290	1,921	288	1,699	1,583	105	538	338	183
Spearman's r_s	0.281***	0.251***	0.077	0.237***	0.224***	0.331**	0.183***	0.320***	-0.008

Note. ***p<.001; **p<.01

Table 4. Modification of training intensity in preparation for the sport event because of COVID-19 measures among event participants, in percentages (N = 1,921)

		Event participant	
χ^2=9.509**	Total	Endurance participant (n = 1,583)	Non-endurance participant (n = 335)
Lower intensity	47.4	46.6^{a}	53.2^{a}
Same intensity	35.5	36.9^{a}	25.1^{b}
Higher intensity	17.2	16.5^{a}	21.6^{a}

Note. **p<.01; $^{a, b}$ differ significantly

Table 5. Hierarchical binary logistic regression models of participation in virtual sport events (1/3)

		Model 1	Model 2	Model 3	Model 4
	Variables	Exp(B)	Exp(B)	Exp(B)	Exp(B)
Individual environment	**Sex (ref. = male)**				
	Female	0.952	1.050	1.047	1.031
	Age (ref. = 18-34 years)				
	35-54 years	0.685*	0.814	0.801	0.800
	55-74 years	0.479**	0.710	0.744	0.736
	Education (ref. = primary/ secondary education)				
	Higher education	0.910	0.879	0.842	0.844
	Still studying	0.678	0.649	0.609	0.571
	Children living at home (ref. = no)				
	Yes	1.041	1.069	1.167	1.185
	Disability[1] (ref. = no)				
	Yes	0.928	0.963	1.059	1.077
	Income	1.019	1.010	1.036	1.049
	Attraction (involvement)	1.360*	1.294	1.142	1.107
	Centrality (involvement)	1.217	1.227	1.187	1.185
	Self-expression (involvement)	0.844	0.901	0.906	0.888
	Escape (motivation)	0.912	0.876	0.922	0.907
	Social recognition (motivation)	1.113	1.068	1.024	1.025
	Enjoying nature (motivation)	0.965	0.977	0.940	0.969
	Excitement (motivation)	1.059	1.103	1.078	1.117
	Risk (motivation)	1.165	1.195	1.224*	1.241*
	Internal socialisation (motivation)	0.903	0.926	0.848*	0.844*
	External socialisation (motivation)	1.029	0.966	0.934	0.938
	Skill development (motivation)	1.423*	1.303	1.354*	1.386*
	Achievement (motivation)	0.918	0.933	0.960	0.948
Interpersonal environment (before measures)	**Frequency sport before measures (ref. = 1 time/week or less)**				
	More than 1 time/week		0.959	0.773	0.629
	Type sport before measures (ref. = endurance participant)				
	Non-endurance participant		1.183	1.132	1.319

Table 5. Hierarchical binary logistic regression models of participation in virtual sport events (2/3)

		Model 1	Model 2	Model 3	Model 4
	Variables	Exp(B)	Exp(B)	Exp(B)	Exp(B)
Interpersonal environment (before measures)	**Intensity sport before measures[2] (ref. = ≤60/90 minutes per session)**				
	>60/90 minutes per session		0.626**	0.661**	0.684*
	Experience in sport (in years)		0.972**	0.972**	0.971**
	Sport with partner (ref. = no)				
	Yes		0.919	0.925	0.942
	Sport with family (not partner) (ref. = no)				
	Yes		0.790	0.759	0.787
	Sport with friends (ref. = no)				
	Yes		0.903	0.864	0.902
	Sport in sport club (ref. = no)				
	Yes		1.025	1.022	1.016
	Participation in events before measures (ref. = ≥13 events)				
	0 events		1.319	1.093	0.970
	1-4 events		0.615*	0.587*	0.510**
	5-12 events		0.806	0.814	0.770
	Participation in virtual events before measures (ref. = no)				
	Yes		6.147***	6.686***	7.031***
Interpersonal environment (since measures)	**Frequency sport since measures (ref. = 1 time/week or less)**				
	More than 1 time/week			3.244**	3.263**
	Desire to competition			0.956	0.955
	Desire to social contact			1.158	1.167
	Desire to conviviality			1.124	1.103
	Modification of training intensity in preparation for the sport event because of COVID-19 measures (ref. = lower intensity)				
	Same intensity			1.534**	1.516*
	Higher intensity			1.668*	1.681*

Table 5. Hierarchical binary logistic regression models of participation in virtual sport events (3/3)

		Model 1	Model 2	Model 3	Model 4
	Variables	Exp(B)	Exp(B)	Exp(B)	Exp(B)
Type event	**Sport event (ref. = running event)**				
	Cycling event				0.745
	Walking event				0.430*
	Triathlon event				0.567**
	Nagelkerke R^2	0.070	0.192	0.223	0.235
	N	1185	1185	1185	1185
	Model χ^2 (df)	59.971 (20)***	172.374 (32)***	202.804 (38)***	214.890 (41) ***

Note. *** p<.001; ** p<.01; * p<.05; [1] disability defined as having a chronical disease, physical and/or mental disability; [2] 60 minutes for running, swimming and dance, 90 minutes for cycling, yoga/fitness, walking, team sports, batting sports and martial arts

Table 6. Hierarchical binary logistic regression models of participation in virtual sport events, according to four different sports

	Running			Cycling			Walking			Triathlon		
	M1	M2	M3	M1	M2	M3	M1	M2	M3	M1	M2	M3
Variables	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)
Risk (motivation)	1.209	1.231	1.245*	0.930	0.934	0.953	0.969	0.719	0.774	1.232	1.194	1.193
Internal socialisation (motivation)	0.971	0.986	0.984	0.824	0.771	0.785	0.758	0.922	1.017	0.746	0.738	0.739
Skill development (motivation)	1.313*	1.088	1.094	4.853***	4.417***	4.059**	2.080	2.481	1.976	1.637	1.572	1.572
Intensity sport before measures[1] (ref. = ≤60/90 minutes per session)												
>60/90 minutes per session		0.635*	0.665*		0.569	0.566		3.976	6.236		0.712	0.714
Experience in sport (in years)		0.955***	0.954***		0.996	0.997		0.997	0.988		0.989	0.989
Participation in events before measures (ref. = ≥13 events)												
0 events		0.949	0.766		1.310	1.103		0.000	0.000		0.000	0.000
1-4 events		0.349***	0.316***		1.131	1.110		2.352	2.318		0.309	0.306
5-12 events		0.649*	619*		0.873	0.869		2.112	1.915		0.622	0.622
Participation in virtual events before measures (ref. = no)												
Yes		5.595***	5.651***		19.348***	21.492***		57.956**	50.889*		3.533**	3.546**
Modification of training intensity in preparation for the sport event because of COVID-19 measures (ref. = lower intensity)												
Same intensity			1.903**			1.801			3.697			1.002
Higher intensity			2.219**			1.155			4.585			1.038
Nagelkerke R^2	0.019	0.169	0.196	0.175	0.436	0.444	0.070	0.345	0.403	0.054	0.148	0.148
N	728	728	728	217	217	217	80	80	80	221	221	221
Model χ^2 (df)	9.705 (3)*	93.922 (9)***	109.816 (11)***	28.662 (3)***	79.694 (9)***	81.525 (11)***	3.474 (3)	18.731 (9)*	22.321 (11)*	8.424 (3)*	23.837 (9)**	23.842 (11)*

Note. *** $p<.001$; ** $p<.01$; * $p<.05$; M1 = model 1; M2 = model 2; [1] 60 minutes for running, swimming and dance, 90 minutes for cycling, yoga and fitness, walking, team sports, racket sports and martial arts; This Table presents four regression analyses which only include the significant variables of Table 5 with the exception of the frequency of sport participation since the measures because of a low number of cases