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# Social Gaming Patterns During a Pandemic Crisis: A Cross-Cultural Survey

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**Abstract.** Games have shown to play a pivotal role as a source of entertainment and social interaction during the COVID-19 outbreak, allowing development and maintenance of positive relationships.

This empirical study investigates how the social gaming patterns of individuals have changed since the COVID-19 outbreak, especially with their family members and friends. For that purpose we administered a cross-cultural survey of players aged 18 and above from Europe and the Indian sub-continent. Findings showed an overall decrease in social gaming, replaced by more time spend playing alone. There were significant differences between the Indian and European samples in terms of social play patterns, highlighting the role of socio-cultural factors on gaming during the pandemic. Ego-network based analysis of social gaming behavior showed four distinct player profiles.

**Keywords:** social gaming · cultural differences · COVID-19 · survey

## 1 Introduction

Human beings are often referred to as social animals and their need for social interaction has been highlighted in research on mental health [30]. This contrasts the situation around the COVID-19 outbreak, when social distancing measures have significantly affected individuals' lifestyle, limiting the possibilities of social interaction. A number of recent studies have warned against the potential health implications due to social distancing and changed lifestyle [1,24]. The emerging mental health challenges have led to an urgent call for international collaboration to tackle the challenges caused by the COVID-19 pandemic [29]. Recent research has posited that technology has a crucial role to play in maintaining social connections with family, friends, and the wider community in times of the current pandemic [16,20].

Virtual social interactions on a daily basis have been recommended along with other healthy lifestyle changes [24]. The World Health Organization has turned its attention towards gaming with a campaign called #PlayApartTogether [21], noticing the reach and potential of gaming as an alternative for people to connect for leisure socially. There is a growing literature on the strengths of video games

to support mental health and well-being, by generating positive affect, positive functioning, and positive social functioning (see, e.g., [11]). As such video gaming environments provide ample opportunities to develop and maintain positive relationships.

The games industry has emerged as a key player in entertainment, with an estimated 2.7 billion players across the globe by the end of 2020, independent of gender, age, and geographical regions [18]. Games offer a social context when played together in the same physical space or remotely. An unprecedented rise in the sale and consumption of digital games during the COVID-19 outbreak has been recorded, as evident in game industry reports and news media [13,18]. However, these statistics do not show whether increase in consumption of digital games is also leading to increased social play or is isolating players from social activities during the time of a pandemic. Researchers have raised concerns related to excessive gaming and called for a more balanced approach, recommending video games that encourage physical activity, social interaction, and collaboration [13,17]. Although the social aspects of gaming are regularly highlighted, there seems to be a lack of information on how people play games socially and how it might have changed since the pandemic outbreak. The present study focuses on games which are played socially with family, friends, and the outside world, and can thus be a medium to develop and maintain 'positive relationships', providing opportunities to share social and emotional support at the time of a pandemic.

Studies have shown that culture also influences social gaming behaviour. Lee and Wohn [14] found that people's culture orientations, measured across vertical and horizontal individualism—collectivism, affected their usage patterns of playing Social Network Games (SNGs), as their expected outcomes were different. Cultural differences have also been observed in gameplay performance in multiplayer online battle arena games [27]. In this paper, we narrow down to two regions – Europe and India – that are culturally distant along the individualism-collectivism dimension [10,25]. Based on empirical data from a cross-cultural survey and by using statistical and ego-network analysis we aim to investigate the following research questions in the context of the ongoing pandemic:

1. How has the COVID-19 outbreak changed the social gaming patterns, especially with family and friends?
2. How do these social gaming patterns vary between India and Europe, representative of different socio-cultural contexts?

The present work aims to contribute to the discourse on social game design and its role in the lifestyle of players during times of crisis.

## 2 Related Work

The discourse of social gaming within family has been heavily shaped by studies examining intergenerational interactions. Costa and Veloso [5] conducted a

literature review on the potential of video games to enhance intergenerational interactions, concluding that *games can foster [them] by contributing to individual well-being, prosocial behaviors, and sharing of knowledge; by enhancing social interactions between different generations toward a communal activity; and by balancing both users' skills and challenges*. De la Hera et al. [9] also reviewed intergenerational digital games reemphasizing their benefits and recommending player-centric and game-centric factors useful for designing these games (such as implementing cooperative competition over purely collaborative or competitive games). However, most of the reviewed papers were case studies focused on games which were specifically designed for the purpose of intergenerational gaming. For instance, *Find It* and *Farmer's Animals* are games that are designed to encourage physical and tangible interaction among family members [8]. Hence, there is room for also looking at the role of off-the-shelf games to promote family and intergenerational interaction. A recent survey [26] included off-the-shelf games and multiple platforms to study the role of video game co-playing on family bonding, however, it specifically looked at the relation between parents and children as co-players. This seems to be consistent with most of the research on intergenerational gaming which targets certain relations such as between grandparents or parents and children, while other family relations such as partners, siblings, etc. have not received the same attention. Postulated recommendations for future research (e.g., [9,26]) include the use of quantitative studies with more participants and relations while studying family gaming practices.

The social network of co-players is not restricted to just family, but extends to real life friends, internet-only friends, online groups (often referred to as game clans), and even strangers. Eklund [7] investigated social digital gaming habits when playing with family, friends, or strangers in a survey with a Swedish population. She concluded that *the practices and meanings of digital gaming are dependent on the relational status of game companions*. Another key discourse in the domain of social gaming involves focusing on specific genres such as Massively Multiplayer Online Games (MMOs) and SNGs as a case to understanding how individuals play together with the wider social network [4,28]. However, being of interest to different disciplines in social science, research goes beyond the in-game aspects and also focuses on the impact these games may have on players' lives. For instance, MMO players have been studied by researchers in relation to their gamer identity and online social capital [12], the effect of games on their real-life behaviour [2], and their psycho-social and emotional well-being [3,31], among others. It is worth noting that sociability in games is not restricted to certain genres such as MMOs but exists in various forms in all types of games, including single-player, two-player, and multiplayer games [22].

Considering that the social constructs of family and friendship are culture dependent, cross-cultural investigation of social gaming and gaming as a leisure activity would be beneficial [7]. Existing research has already shown that usage patterns and performance in social gaming can be influenced by culture [14,27]. However, existing studies on social gaming have predominantly accounted for the Western context while the Indian sub-continent seems to have received much less

attention. Nonetheless, the lifestyle changes caused by the COVID-19 outbreak are unprecedented across the globe and there is scant empirical evidence on the role of games during times of crisis as we face today. Toledo’s [23] recent survey seems to be the closest to our work, looking at the shift in motivations and approaches for gaming in a survey with a primarily American population.

The present study aims to extend some of the related work. Firstly, instead of focusing on certain relations such as between grand-parents or parents and their children, we study social gaming patterns with diverse categories of co-players. Secondly, we attempt to include and capture varying play contexts such as remote and co-located play, including a diversity of game types and platforms. Thirdly, we attempt to include the perspective from the Indian sub-continent. Lastly, we aim to address the research gap on how social gaming manifests in times of a pandemic crisis with social distancing measures significantly affecting our lifestyle. This becomes especially relevant, given the various benefits of socialization through games in mitigating some of the negative impacts of COVID-19 for adults [15].

### 3 Study

We designed a comprehensive English language online survey to capture social gaming patterns of players before and during the COVID-19 outbreak, delving deeper into their social gaming networks. The study uses *gaming partner* as a term to represent co-players or game companions and further differentiates them into categories (i.e. types), as discussed later. The survey was split in different parts. The parts of interest for the investigation presented here included (in the order they were presented): 1) demographics and 2) details about the gaming behaviour with selected gaming partner(s). Apart from the sections, the survey had an introduction page with a description of the purpose of the study, ethical information about data collection and usage, and consent for voluntary participation for respondents above 18 years of age. The length of the survey was dynamic based on the number of gaming partners, as explained further when detailing the parts of the survey below:

*Part 1: Demographics* This section collected basic descriptive information of the respondents, including their age, gender, country of residence, employment, household structure, gaming behavior, and gaming partners.

*Part 2: Gaming Partner(s)* This section probed in more detail about each of the selected gaming partner categories which included different family relations such as parents, partner, siblings, etc. as well as real-life and internet-only friends, virtual gaming groups, and strangers. As such the survey was dynamic in length and would display only the categories of gaming partners selected in Part 1. The questions focused on comparing the gaming patterns with the selected partner(s) before and during the COVID-19 outbreak (e.g., number of co-players, weekly duration of play in hours, enjoyment (on a 10-point scale from 1 = not enjoyable

to 10 = very enjoyable), play style in the sense of being casual or competitive (on a 10-point scale from 1 = very casual and 10 = very competitive.), living in same or different households).

The research was approved by the ethics review board of the university. The online survey was administered through *LimeSurvey* hosted at the university. Recruitment involved sharing the call for participation using email lists and personal and professional social networks of the researchers (including *Whatsapp* and *Twitter*), as well as posting the call to gaming related forums such as *Reddit* and *IGN* boards. The call included a link to the survey and a request for propagating the call further. Thus our sample should be viewed as a convenience sample followed by snowballing. Participants did not receive any compensation and the participation was voluntary. Responses were collected during an approximately three week period in late August to early September 2020.

### 3.1 Participants

After removing incomplete responses, the survey garnered 95 complete responses in total. Out of these, 12 respondents indicated that they 'do not play games at all' and 14 respondents indicated that they 'play games alone but not with others'. The remaining 69 respondents played games with others, of which 15 indicated to only play games with others and not alone. As we are mainly interested in social gaming patterns we will specifically focus on these 69 participants. Five of these provided erroneous data and were thus excluded as well, yielding a final sample of  $N = 64$ .

Of these, 2 were below 20 years of age, 40 between 20 and 29, 12 between 30 and 39, 6 between 40 and 49, 2 between 50 and 59, and 2 between 60 and 65. In terms of gender, there was an almost even split between males (28) and females (34), one identified as non-binary and one as cis-genderless male. 29 participants came from India, 26 from European countries, and 9 from other countries such as Canada and the US. Due to the very low number of responses from countries outside Europe and India we dropped these and focused on investigating cultural differences between Europe ( $N = 26$ ) and India ( $N = 29$ ). Nine participants lived in single person household, 12 in a two-person, 15 in a three-person, and 19 in a four-person household. In addition, 6 lived in a five-person household and one participant each in a six, seven, and 10-person household, respectively.

### 3.2 Analysis

To understand the effect of the COVID-19 lockdown on social game play, we first investigated standard statistics for the demographic variables and the administered ratings.

Next, we looked into possible effects of the cultural differences on variables for social gaming. The following results on cultural differences are thus based on 29 respondents from India and 26 from Europe. In the following, we will use the label 'region' to distinguish between them. Mixed two-way ANOVAs with REGION (India, Europe) as between-subject and TIME (before, during) as within-subject

variable were calculated for duration, the number of people participants play with, enjoyment, different types of gaming partners, play style, and centrality (a common metric in network analysis, as detailed below).

To investigate how social gaming changed in terms of the formed relationships, we employed ego-network analysis. Ego-networks are commonly used, for instance, in the social sciences to model such social relationships through a graph in order to analyze their structure (see, e.g., [6]). For each participant, we constructed an ego-network with the participant itself being the ego and the indicated gaming partners forming the direct connections (alters). The weight of a tie was defined as the indicated hours of play with the respective type of partner. Each ego-network was built twice, once with the data covering the situation before the onset of COVID-19 and once during it.

Figure 1 (p. 9) shows examples of such networks. For visualization purposes both networks (before and during) were combined into a single one to ease comparisons. The ego is visualized in the center of it and gaming partners were arranged circularly around it. In addition, gaming partners of the same type were merged into a single node with the node size reflecting the number of partners. The thickness of a tie (edge) indicates the number of hours played with the respective type of partner. Black ties correspond to the situation during COVID-19 and gray edges to before it. In addition, nodes were color-coded using a red-to-green color gradient to indicate how enjoyable playing games with a certain kind of gaming partner was perceived on average. Red corresponds to *not enjoyable* and green to *very enjoyable*.

For instance, looking at the top-left ego-network in Figure 1 we can observe that the participant played with more real-life friends for longer time periods during than before the pandemic (increased node size and edge width). The participant also started to play with his/her siblings and parents. In contrast, the time spent playing with his/her partner and children declined during the pandemic. Enjoyment experienced while playing with different gaming companions was generally high and also was not affected by the crisis. In contrast, the participant with the bottom-right ego-network spent less time playing with all his/her gaming partners (thinner black edges) and also reported a decline in enjoyment when playing with his/her partner and especially real-life friends.

For each network (before and during) we also calculated the node centrality  $c$  of the ego based on Opsahl et al.'s measure [19] for weighted networks to include both the degree of the node and the strength of its connections. For a node  $i$  it is given as  $c = k_i^{1-\alpha} \cdot s_i^\alpha$  where  $k_i$  is the degree of node and  $s_i$  the sum of weights of the incident edges.  $\alpha$  is a tuning parameter which controls the relative importance of the aspects. If  $\alpha = 0$ ,  $c$  is equivalent to the degree and if  $\alpha = 1$  it is based on tie weights only. We used an  $\alpha$ -value of 0.5 in order to weigh both aspects equally, meaning that higher centrality corresponds to participants playing with more people for longer time periods.



**Table 1.** Average values regarding time spent playing and the time available for recreation (in hours) for the complete sample as well as for the European and India subsamples. Numbers in brackets denote standard deviation.

	Complete Sample	Europe	India
Hours playing [total, before]	17.67 (16.75)	17.85 (19.58)	18.91 (16.57)
Hours playing [total, during]	17.23 (16.83)	19.65 (19.48)	16.35 (16.62)
Hours playing [solo, before]	4.80 (6.88)	5.50 (8.82)	3.56 (4.97)
Hours playing [solo, during]	8.04 (10.88)	7.80 (11.70)	8.00 (11.57)
Hours playing [social, before]	12.53 (12.24)	12.12 (12.16)	14.69 (13.39)
Hours playing [social, during]	8.36 (9.46)	10.12 (11.04)	7.72 (9.14)

## 4 Results

### 4.1 Changes in Social Gaming Styles

With media reporting increased gaming activity around the world during the COVID times, the present study tried to further differentiate between the solo and social gaming activity of the survey respondents. As Table 1 shows participants in our sample spent on average 17.67 hours per week ( $SD = 16.75$ ) playing games. While before COVID-19 on average of 4.8 hours ( $SD = 6.88$ ) were spent playing alone this raised to 8.04 hours ( $SD = 10.88$ ), and social game play – which was 12.53 hours per week ( $SD = 12.24$ ) before – fell to 8.36 hours ( $SD = 9.46$ ). These results seem to be counter-intuitive to the assumption that being in quarantine and socially isolated would have led to an increased playtime with others. It is worth noting that this tendency seen in overall sample is shaped by participants from both India and Europe with varying socio-cultural contexts. These differences are discussed in more detail later in this section.

Next, we compared the number of gaming partners, the different types of gaming partners, hours played, average enjoyment when playing with others, play style, and centrality before and during the COVID-19 outbreak across the whole sample. Paired t-tests only yielded a significant difference at  $\alpha = .05$  in terms of centrality, showing a drop from 10.18 ( $SD = 8.26$ ) to 7.80 ( $SD = 7.04$ ) during the pandemic. Recall that centrality considers both the number of gaming partners and the time spent playing with them.

To investigate differences between Europe and India, the above listed variables were analyzed individually using mixed two-way ANOVAs with REGION as between-subject variable and TIME as within-subject variable (cf. Table 2).

Results show certain significant differences in social gaming behavior before and during COVID-19 and between India and Europe. There was a significant difference in the number of gaming partners people played with. Participants from Europe reported to gain in number of playing partners, with before on average 8.81 ( $SD = 6.35$ ) partners to an average of 11.0 ( $SD = 11.41$ ) during COVID-19. Participants from India indicated the opposite direction with fewer playing partners – dropping from 11.00 ( $SD = 7.48$ ) to an average of 8.14 ( $SD = 11.11$ ).

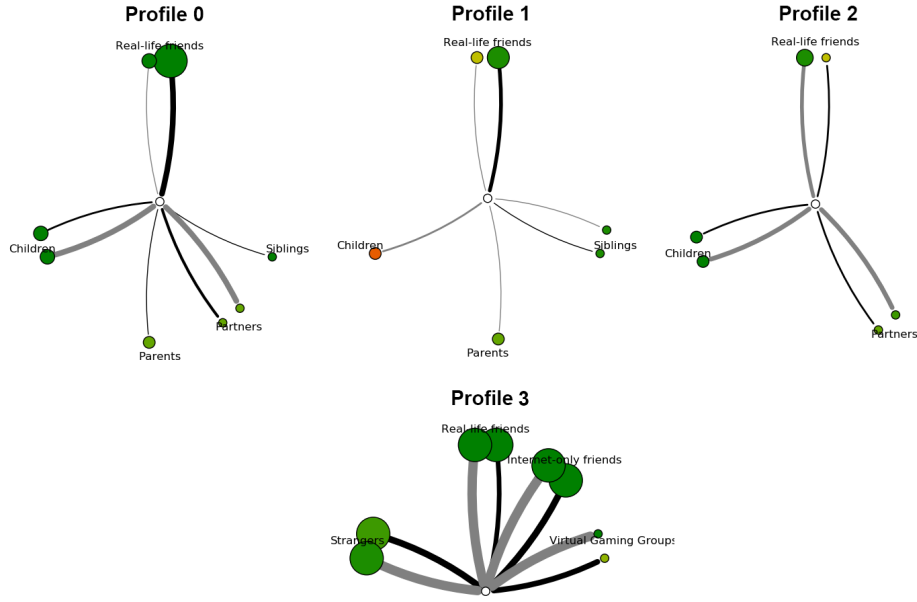
**Table 2.** Results of mixed two-way ANOVAs with REGION (Europe/India) as between-subject and TIME (before,during COVID) as within-subject variable.

DV	Source	SS	F	p
NUMBER OF GAMING PARTNERS	region	1.064	0.006	.93
	time	10.509	0.809	.37
	<b>interaction</b>	<b>194.747</b>	<b>14.986</b>	<b>&lt; .001</b>
DIFFERENT TYPES OF GAMING PARTNERS	region	6.836	3.014	.088
	time	0.000	0.000	1.0
	<b>interaction</b>	<b>2.955</b>	<b>9.187</b>	<b>&lt; .01</b>
ENJOYMENT	region	27.246	3.104	.084
	time	20.641	3.870	.054
	interaction	11.763	2.206	.143
PLAY STYLE	region	3.912	0.258	.614
	time	3.433	1.039	.313
	interaction	10.237	3.099	.084
HOURS PLAYING	region	0.230	0.001	.976
	<b>time</b>	<b>586.5090</b>	<b>30.165</b>	<b>&lt; .001</b>
	<b>interaction</b>	<b>169.008</b>	<b>8.692</b>	<b>&lt; .01</b>
CENTRALITY $\alpha = 0.5$	region	0.072	0.001	.980
	<b>time</b>	<b>170.096</b>	<b>16.365</b>	<b>&lt; .001</b>
	<b>interaction</b>	<b>135.464</b>	<b>13.033</b>	<b>&lt; .001</b>

$df_1 = 1$ ,  $df_2 = 53$  in all cases, significant results are marked in bold

The type of gaming partners also changed, although to a lesser extent, showing only a tendency. European participants seemed to have more diverse gaming partners, with a raise from 2.65 (SD = 1.06) to 3.00 (SD = 1.17), while in India the effect was reversed with the number of different gaming partners becoming less, declining from 2.48 (SD = 1.06) to 2.17 (SD = 1.26). Results indicate significant interaction effects for both, number of gaming partners ( $F(1, 53) = 14.99$ ,  $p < .001$ ) as well as different types of gaming partners ( $F(1, 53) = 9.19$ ,  $p < .01$ ).

Game enjoyment, measured on a subjective rating scale from 1 to 10 (from 1 = not enjoyable to 10 = very enjoyable), showed a tendency that game enjoyment stayed nearly the same for participants from Europe with an average of 8.31 (SD = 2.61) before and an average of 7.97 (SD = 1.31) during the pandemic, while for participants from India social gaming became less enjoyable with the mean dropping from 7.97 (SD = 2.04) to 6.48 (SD = 3.87). There was no significant effect of the quarantine situation on the enjoyment in games for both regions. The same holds true for the style of playing (casual vs. competitive), staying mostly unaltered before and during COVID-19. Casual play style was indicated on a scale from 1 to 10, where 1 was very casual and 10 was very competitive. The play style in Europe on average was 4.6 (SD = 2.38) staying at the same level during the pandemic (M = 4.89, SD = 2.27), in India the play style became



**Fig. 1.** Examples of ego-networks of participants falling within Profile 0 to 3. The size of a node corresponds to the number of gaming partners of the respective type and edge width reflects the number of hours played together. Black ties are before COVID-19 and gray ones before it. The color of the nodes indicates how enjoyable playing together was (red = not enjoyable, green = very enjoyable).

less competitive ( $M = 5.59$ ,  $SD = 3.48$  to  $M = 4.89$ ,  $SD = 3.68$ ), although this change was not significant.

Hours spent playing changed significantly before and during the pandemic. While the overall results showed a decrease in social gaming time, these values differed between the European and Indian participants. Europeans indicated to play on average 12.12 hours per week ( $SD = 12.16$ ), which lowered during the pandemic phase to 10.12 ( $SD = 11.04$ ), while participants from India nearly played 50% less, dropping from an average of 14.69 ( $SD = 13.39$ ) to 7.72 ( $SD = 9.15$ ). So, even though the social gaming time reduced for the overall sample, a mixed two-way ANOVA showed no main effect of region. However, the interaction effect between region and time was significant ( $F(1, 53) = 13.03$ ,  $p < .001$ ), pointing to a steeper decline for India than Europe.

## 4.2 Ego-Network Profiles

To develop profiles of social play patterns based on the ego-networks we performed a  $k$ -means clustering using the centrality measure as well as the average enjoyment and the number of different types of gaming partners (parents, siblings, ...) before and during COVID-19 as input variables. Clustering was performed for  $k = 2 \dots 20$  and the sum of the squared error (SSE) and silhouette

coefficient was calculated for each  $k$ . The silhouette coefficient and inspection of the SSE plot for an elbow pointed to a four or five cluster solution. Accounting for interpretability, we opted for the four-cluster solution since the five-cluster solution produced a cluster with a single participant only.

Figure 2 shows how the measures vary over the four identified profiles and Figure 1 provides examples of ego-networks from each profile. In the following we will describe these in more detail:

**Profile 0:** Participants in this group show the second highest values in terms of centrality. Together with participants falling within Profile 3 they play with the most different types of gaming partners but compared to Profile 3 the pandemic resulted in a slight increase with which types of gaming partners they play with. They adapt a neither very casual nor very competitive play style which also shifted slightly towards casual during the pandemic. Eight participants fall within this profile.

**Profile 1:** This profile encompasses participants that show the least social play independent of the onset of the pandemic. While generally the least active, the pandemic had no major influence on the enjoyment and the types of gaming partners they play with. In contrast to the other profiles, the play style developed towards a slightly more competitive one during the pandemic. This cluster forms the largest with 33 participants being assigned to it.

**Profile 2:** Participants in this group are first and foremost characterized by a large drop in terms of centrality, showing a decline of about 50% in their social gaming activities. Enjoyment also dropped the most across all four clusters to a bit above average. People in this cluster also played with fewer different kinds of family members and friends compared to those in Profile 0 and Profile 3. As participants belonging to Profile 3, people in this group adapted a more casual form of play during than before the pandemic. With 19 participants this is the second largest cluster.

**Profile 3:** Participants falling within this profile are characterized by the largest centrality values, i.e. they are playing with many people for extended periods of time. Average enjoyment was rather high but declined slightly during the pandemic. They played on average with 3.5 types of gaming partners, which together with participants from Profile 1 is the highest number. Style of play is the most competitive one across the profiles with a small decline in competitiveness during the pandemic. This cluster constitutes the smallest of our sample with only four participants being part of it.

## 5 Discussion

The present study collected empirical data using a cross-cultural survey to understand the impact of the COVID-19 pandemic on social gaming patterns of individuals. We found differences in the social gaming behaviour of individuals before and during the outbreak with respect to the number and types of gaming partners as well as the time spent playing with them (as also reflected in the

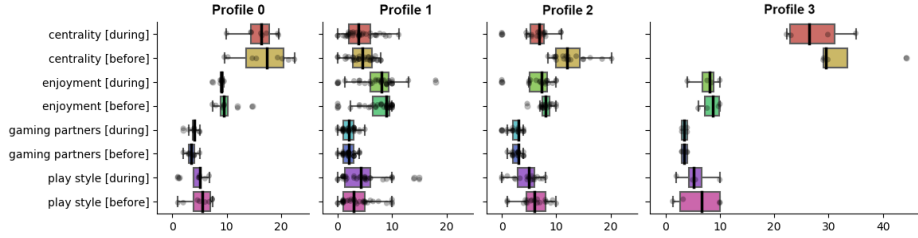


Fig. 2. Variation of features across the four identified clusters.

	Complete Sample		Europe		India	
	before	during	before	during	before	during
different households	0.57	0.50	0.65	0.56	0.54	0.49
same household	0.25	0.29	0.29	0.31	0.28	0.36

Table 3. Fraction of different types of gaming partners within the same and different households. Note: Must not sum to one as other options such as ‘does not apply’ were provided as well.

centrality measure). Interestingly, these values were noticeably different based on geographical region and culture. In the following we elaborate upon the most interesting insights from the results.

While the overall gaming time for the overall sample remained almost the same, the time spent playing solo almost doubled during the COVID-19 outbreak and the time spent playing socially got reduced by almost the same amount in our sample. This shift in social playing behaviour was more prominent in the Indian sample. It is worth noting that more gaming partners lived in different households than in the same household (cf. Table 3). It is possible that the co-located play opportunities before the pandemic, especially for partners from different households, did not shift to remote play during the pandemic, reflecting in the fall in social gaming. These results are contrary to a recent survey on video game habits during the pandemic, where majority of respondents stated an increase in their overall playing time, especially those motivated by competition and social aspects [23]. However, their study did not differentiate between solo and social playing times and captured a different socio-cultural and geographical context, so it is difficult to compare the findings.

It is possible that playing remotely could have been affected due to changes in lifestyle and daily routine during the pandemic and thus respondents preferred playing solo more. However, this finding can be overshadowed by a variety of processes. For instance, the overall feeling of loneliness of participants due to social distancing measures might have influenced their remembered activity patterns before and during the pandemic. This is always a limitation of studies that ask for behavior in retrospect.

The COVID-19 situation had an impact on both the number and type of social gaming partners, as reflected in the significant decrease in centrality ( $\alpha = 0.5$ ). Perhaps, more surprising was the clear difference in the way the COVID-19 outbreak impacted social play for Indian and European participants. While European participants reported an increase in the number of gaming partners, type of gaming partners, and no difference in game enjoyment, Indian participants showed a significant decrease in the number of gaming partners together with a decrease in the type of gaming partners and game enjoyment. Statistics showed a significant difference in the family size between the respondents from India and Europe in our sample (Europe:  $M = 3.11$ ,  $SD = 1.21$ ; India:  $M = 4.13$ ,  $SD = 1.60$ ). This could be one of the factors highlighting the different playing contexts between the two regions. However, other factors such as differences in the extent of the pandemic crisis or socio-cultural differences in family and friendship dynamics as well as gaming habits could be influential as well. A follow-up qualitative study would thus help in exploring and explaining these differences further. Yet, our results highlight that social gaming is culturally dependent and it is important to include cultures which are relatively understudied.

The changes in social gaming were further explored by means of ego-networks. Cluster analysis of the ego-network profiles resulted in four distinct types of players. Ego-network based analysis presents an interesting framework to understand social gaming behavior of individual players. It might be useful for game user researchers to use the patterns identified through clusters of ego-networks to inform the design of games in the future.

### 5.1 Limitations

We used an online survey for data collection because of accessibility and allowing participants to share data anonymously. However, considering the comprehensive nature of the sought information, the survey completion rate was significantly affected. One of the main limitations of the present study is the small sample size and the use of convenience sampling. However, having almost equal responses from the Indian sub-continent and Europe allowed us to present a snapshot of these populations. It is worth acknowledging that due to the small sample size the identified results and directions are indicative in nature, thus requiring further enquiry. Within the limitations of convenience and snowballing sampling, the sample was diverse in age, gender, household structure, family relations, and can thus be viewed as representative of the intended population. Lastly, the survey was conducted using English language which may have introduced a bias in the sample. A follow-up study that compares the during and after pandemic context might be interesting in order to extend the current work.

## 6 Conclusions

Using a survey for data collection and ego-network analysis, the present study identified how social gaming patterns changed in the time of a pandemic crisis.

Overall, it was surprising to see that individuals spent less time for social gaming since the COVID-19 outbreak considering that people might want to compensate their missing social connections through social gaming. However, these insights are tentative and indicative due to the limited sample size. Within these limitations, the findings highlighted that there might be a multitude of factors influencing social gaming patterns, in addition to the rise and fall in number, as generally pointed out by media. For instance, differentiating between co-located and remote social play, as reflected by playing partners living in same or different households, might lead to a more nuanced understanding of social play behavior. The cultural differences seen in social gaming patterns during the pandemic present an interesting direction to explore in the future studies and a follow-up qualitative study would help in understanding the underlying factors that play a role in shaping the social gaming behaviour of people during the pandemic.

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